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IN SHIP YARDS OF THE GREAT LAKES.

NEW ORDERS INCLUDE A 6000-TON VESSEL TO BE BUILT AT PORT HURON AND ENGINES FOR THE ROCKEFELLER BARGES.

With a 3000-ton ship well along towards the launching stage and with an order in hand for a 6000-ton vessel (both steamers) the Jenks Ship Building Co. of Port Huron, Mich., will soon have a steel ship yard of no mean proportions. As a result of negotiations which Mr. Carpenter of the Jenks company has been conducting in Cleveland for several days past, it is understood that these two vessels are to be owned in the office of Capt. Thomas Wilson of Cleveland. Prices are not given out, but the Welland canal size vessel—the one on the stocks—is undoubtedly worth, under the present range of prices, about $170,000 and the 6000-ton steamer about $310,000. The Jenks company has had an option for some time past on material for the large vessel, which is to be completed about Aug. 15 of next year. Some new tools will very probably be needed in both the ship yard and engine works of the Jenks plant, in order to hurry the completion of these two vessels, but Mr. Carpenter says his company has no fear of its ability to get the vessels out within the time specified. Work on the engines of the large steamer may be started at once, as both boilers and engines of the vessel on the stocks are practically completed and will soon be taken apart and put together again in the ship, which is to be launched with machinery aboard. The hull of the 6000-ton steamer will be, with the exception of 4 feet additional length, a duplicate of the hull of the steamer Frick, recently completed at Cleveland for Capt. John Mitchell and others. The dimensions are 420x50x28 feet. Engines will be the same as those in the Wilson steamer Oliver—cylinders 23, 38 and 63 inches diameter and 40 inches. Boilers will also be the same as those of the Oliver—three of them, each 12½x12 feet.

Arrangements have just been made by the Bessemer Steamship Co. with the American Ship Building Co. whereby two steel vessels now under construction for the steamship company, one at West Superior and the other at South Chicago, will be steamers instead of tow barges. In other words the Bessemer company will have three new steamers instead of a steamer and two tow barges coming out next spring. The third steamer is building at the Globe works, Cleveland. This will make the Rockefeller fleet next season fifteen steamers and twelve tow barges, in addition to the thirty whalebacks. This change in two of the new vessels will delay their completion until about June 1. As tow barges these vessels would carry about 7,500 gross tons each. As steamers they will probably not carry more than 6,500 to 6,700 gross tons, but there are, of course, great advantages to be gained in the change to steam, especially in times of such great activity as now prevails in the lake trade. The engines are to be quadruple expansion but of only 2,000 horse power, as against about 3,000 horse power in the Rockefeller steamers Morse and Houghton. This less powerful machinery equipment will, however, be of the high order found in the other steamers, including hollow forged steel shafting of Bethlehem Steel manufacture.

The statement that the Carnegie-Oliver mining interest had secured an option that gives them until May 1 of next year the call on all berths that become vacant in the ship yards of the American Ship Building Co is not in accordance with the facts. "I give the heads of the American Ship Building Co. credit for better judgment than to do anything of that kind," said a Cleveland vessel owner who was discussing the matter with General Manager James Wallace of the ship building company. "If such was the case" he continued, "I am sure I could go out and in forty-eight hours get a million dollars for the establishment of a competing ship yard." Then Mr. Wallace explained that the option was only a 30-day option which was made in connection with the contract for six new Carnegie ships and which will expire two weeks hence. It does not prevent the ship building company from figuring with other owners for new vessels, even within the 30-day period, as the Carnegie company, upon being informed of other negotiations for new orders, must make answer within twenty-four hours as to whether they desire under the option to meet the terms attending such negotiations.

The announcement from Duluth that Capt. Alex McDougall is to be connected with a new ship building concern to be known as the Collingwood Dry Dock Co., and which is to begin with the construction of vessels of Welland and St. Lawrence canal dimensions, probably contains some truth. Capt. McDougall has given a great deal of attention to the Canadian canals and is enthusiastic over the prospects for developing a great trade through the St. Lawrence to the seaboard. It is understood that he has been considering for some time past with Canadian capitalists the development of a project that involves the construction of a short railway, grain elevators, etc., as well as the operation of vessels from Lake Ontario to the seaboard through the St. Lawrence.

It is understood that all four of the Carnegie steamers (two of the fleet are to be barges) to be built by the American Ship Building Co. will be equipped with quadruple expansion engines and Babcock & Wilcox water tube boilers.

The next vessel to be launched in a lake ship yard will be the 6,000-ton steamer which the Detroit Ship Building Co. has under way at its Wyandotte yard for Senator McMillan and others, and which will be managed by Mr. A. McVittie.

DEATH OF WILLIAM HENRY WEBB.

Probably there was not in America a man more widely known in shipping and ship building circles than William Henry Webb, who died a few days ago at his home in New York City. He was eighty-four years old. Mr. Webb's life was part of the history of American ship building.

His father, Isaac Webb, began his work as apprentice to Henry Eckford, who made a national reputation as a ship builder during the war of 1812. W. H. Webb was born in New York on June 19, 1816. It was not intended that he should follow his father's profession, but his education under private tutors and in the Columbia College grammar school revealed the bent of his mind.

Before he was twenty-three he built three packet ships under sub-contracts in his father's ship yard. He had to make a voyage to Europe for his health in 1839, and while abroad his father died. In 1843 Mr. Webb took charge of the entire business. For thirty years he was one of the most prominent ship builders in this country. In 1848 he built the Cherokee, the first steamship to be run between New York and Savannah, and the first steamship for the New Orleans trade. He also built the first Pacific Mail steamship. He designed and built the General Admiral for the Russian navy in 1858, and subsequently built ironclads for the United States, Italy and France. The steam ram Dunderburg, which he built during the civil war, and which became the Rochambeau of the French navy was the fastest warship afloat. Mr. Webb's ironclads were the first to cross the Atlantic. Mr. Webb was an original shareholder of the Pacific Mail Steamship Co. He was also one of the original subscribers to the building of the Panama railroad. From 1868 to 1870 he was largely interested in a line of steamships engaged in the European trade. He retired from business in 1872. Mr. Webb refused a nomination for mayor of New York three times. Recently he established the Webb Academy and Home for Ship Builders, a free educational institution for instruction in ship building and marine architecture, and a home for old and infirm ship builders. The academy is on Fordham Heights. Mr. Webb was a member of a number of the leading New York clubs and was a vice-president of the Society of Naval Architects and Marine Engineers since the inception of the organization.

PRICES OF IRON ORE—LAKE FREIGHT MATTERS.

Although ships to move practically the entire output of ore from the Lake Superior region in 1900 have been engaged, nothing has been done as yet by the ore dealers regarding prices. The head of one very large concern is in Europe, and this has had something to do with the delay. It will very probably be two weeks or more before action is taken by the Bessemer association. In the meantime the representatives of lading interests do not think it advisable to commit themselves in any way regarding prices. Last year the base price for old-range Bessemers was $2.95. It is quite probable that it will not be less than $5 this year, or an advance of full $2 a ton. There has been very little chartering for 1900 during the past week, and it may be said, in fact, that there is nothing left to be done, as practically the entire fleet that engages in the ore trade is under engagement for next year.

The present freight situation is by no means encouraging to the vessel interests. The grain markets have been so much out of line as regards prices that the movement from both Chicago and Duluth has been reduced to very low figures. Ships have been crowded into the ore trade and the result is a general reduction in rates. At this writing the head of the lakes rate is down to $1.50 with Marquette at $1.40 and Escanaba at $1.25. It is not expected, of course, that this general inactivity in grain will continue throughout the balance of the season, but it has now lasted long enough to have a very marked effect on freights. Shortage of cars in which to move coal and weather conditions favorable to steady sailing have also been important factors in the freight market. Unless the grain movement soon shows decided improvement, the finish of the season will be at freights very much below the high figures of the past two months.

The reduced rates will very probably bring out a few blocks of ore that would not otherwise be moved. Some of it showed up just as soon as the reduction to $1.50 basis from the head of the lakes was announced.

Detroit newspapers are making all kinds of guesses as to why the heads of the Detroit & Cleveland Navigation Co. and Detroit Ship Building Co., who had plans made for two immense side-wheel steamers of great power for Detroit-Buffalo service, did not go ahead with the construction of the vessels. The very high prices now prevailing for new ships undoubtedly had something to do with the suspension of work on this scheme. It is not dead, however, and there are some people keeping a close watch of steamboat passenger business on the lakes who would not be surprised to see, at some time in the near future, a consolidation of the Detroit & Cleveland and Cleveland & Buffalo lines, with the third link in the chain—the Detroit and Buffalo project—taken up by the new company.

In the sale of the steamer Robert Wallace, purchased a few days ago by James Corrigan of Cleveland, through W. C. Richardson, David Wallace of Lorain disposes of the last of the fleet of vessels which he controlled for a great number of years. The schooner David Wallace went to the Atlantic coast and the steamers Vega and Vulcan were sold, not long ago, to Drake and Maytham of Buffalo. The Robert Wallace was sold for $40,000.

A NEW ENGLAND SHIP BUILDING INDUSTRY.

THE SPLENDIDLY EQUIPPED PLANT OF THE FORE RIVER ENGINE CO. AT WEYMOUTH, MASS.—DESCRIPTION OF TWO TORPEDO BOAT DESTROYERS.

It is the intent of this article to give the readers of the Review a description of a ship and engine building industry which has already achieved deserved prominence, and which, in the course of the next decade, will undoubtedly make itself well known for a high class of work in hull construction and marine engineering. The industry referred to is that known as the Fore River Engine Co., Weymouth, Mass. (a suburb of the city of Boston). The plant is excellently situated on the north bank of the Weymouth Fore river, which empties into Boston harbor. The inception of the company, in 1884, was due to Mr. Frank O. Wellington, now the manager, and Mr. Thos. A. Watson, one of Boston's prominent capitalists, who is the treasurer.

For several years this company gave its attention to the building of marine engines and boilers, and has furnished the engines for a large number of the yachts and steamers now in service on the Atlantic coast. Its success soon made it the principal builder on the New England coast, so much so, that to say a marine engine was built by the Fore River Engine Co. was sufficient to place upon it the stamp of approval for every desirable quality of strength, combined with lightness, high speed, etc. A few types of the company's engines are illustrated in connection with this article. From successful engine building, the company entered upon the construction of yachts and steamers, and about one year ago added a steel ship building plant, and is now prepared to build vessels up to 4000 tons displacement. The plant and yard cover, at present, an area of 5 acres, with a water front of one mile. The company owns 60 acres of land immediately adjacent to its works, thus possessing ample grounds for expansion, which is coming with the rapidly increasing volume of business.

DESCRIPTION OF THE WORKS.

From the street the visitor enters the office building, 100 feet in length; to the right are the company's offices and to the left a suite of offices set apart for the use of the inspectors of government work and their assistants. From the office building the next step is to the stock, tool and storeroom, attached to which is the testing room and laboratory, completely equipped, including a testing machine of the most recent design and of 150,000 pounds capacity. One next enters the machine shop with its long array of the latest and most improved tools, from the tiny drill and lathe to the large boring mill and planer. Among the many machines, a number that attract especial attention are a 10-foot vertical boring and turning mill; a 24-foot planer, having two vertical and two horizontal heads, and a 30-foot triple geared engine lathe. In the north wing of the shop are a 5-foot planer, 16-inch slotter and 48-inch horizontal boring mill, with engine lathes, radial drills, and a variety of smaller tools. In this wing are placed the erecting floor and foundations. In the south wing of the shop are the tools for lighter work, including horizontal and vertical milling machines, radial, upright and multiple drills, planers, screw machines, engine and turret lathes. On the floor next above the machine shop is the pattern shop, with a complement of pattern tools and devices in every way sufficient for the varied class of work done there.

BLACKSMITH SHOP, FOUNDRY, POWER HOUSE, ETC.

In the centre of the yard are the blacksmith shop and foundry. The former is supplied with the usual tools and steam hammers, while the latter is fitted with furnaces, core ovens, etc., to meet all requirements. In connection with the forge there has been installed an annealing furnace and oil-tempering bath, particularly designed for the treatment of nickel steel material. Adjacent to the foundry is the power house of the plant with Corliss engine and electric generators.

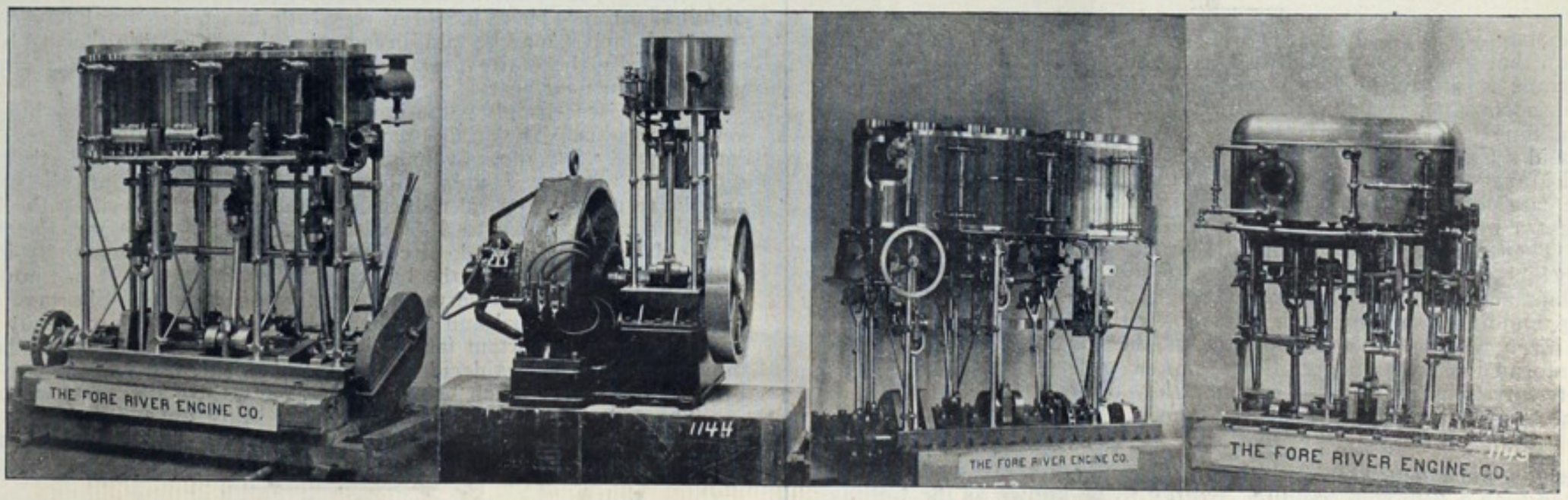
In having its own galvanizing plant, the Fore River Engine Co. is a pioneer among ship building companies, and it installed this addition to its works with a view of the saving in time and expense which has resulted. Its largest tank is 33 feet long and 5 feet deep and holds 50 tons of melted zinc, in which the largest size ship plates may be immersed. From the galvanizing building the visitor goes to the ship tool shop. This is equipped with modern ship building tools—plate planers, shears, bending and straightening rolls—and a variety of portable electrical tools especially designed and manufactured by the Fore River company for its use. On the east side of the ship tool shop is the ship smith shop, with angle and plate forges, bending blocks and bar and plate furnaces; the furnaces are heated by oil fuel. Above the ship tool shop is the smaller mould loft.

BUILDING VESSELS UNDER COVER.

We next pass into the ship house, 260 feet long by 80 feet wide, built especially for torpedo boat and yacht hull construction. It is the company's belief that building the light hulls of yachts and torpedo boats under cover, where the workmen as well as the work are protected from bad weather in winter and the hot sun in summer, produces a quality of work which can never be attained when such hulls are constructed out of doors. This building is well lighted, well ventilated and is in every respect conveniently appointed. It is furnished with a circulating system of heating whereby, in coldest weather, a temperature of 60 degrees may be maintained. The ship house has four overhead travelling cranes, each of 10 tons capacity. In the upper part of the ship house are located the joiner shop and the larger mould loft. All the portable tools (already referred to), such as the counter-sinking machines and drills, are run by electric motors. A distinctive feature of this plant is its system of electrical power distribution. All of the machinery, except in the older part of the machine ship, is run by electric motors. A telephone system connects all parts of the works.

MACHINE SHOP OF FORE RIVER ENGINE CO.

As illustrative of one of the various classes of work done at this plant, it will not be amiss to enter somewhat into the details of the United States torpedo boat destroyers Nos. 8 and 9, Lawrence and Macdonough, now being built by the company for the United States navy. These vessels, which are being constructed wholly from the Fore River company's designs, are identical in type, and are to attain the high speed of 30 knots an hour. Their general dimensions are: Length over all, 246 feet 3 inches; extreme beam, 22 feet 3 inches; depth of hull, 16 feet 8 inches; greatest draught, 8 feet 6 inches; displacement (loaded), 470 tons. The hull is of steel, all parts of which, to a height of 1 foot above the water line, are galvanized. The shaft has two outboards bearings with struts to the hull. The hull is very much cut away aft, in order that the screws may have sufficient water, and the stern is very flat to prevent the boat from settling when running at high speed, thus maintaining a level gun platform. These vessels are provided with bilge keels. Nickel steel has entered largely into the hull and machinery construction in order to obtain the maximum possible strength with the minimum weight. The hull is divided into twelve watertight compartments by means of bulkheads, and a watertight flat, or deck, under the



Triple Engine with Side Shaft Valve Gear. | Direct Connected 80-Light Generator. | 8, 12½, 21 and 12-inch Triple Expansion with Bar-link Motion Valve Gear. | 5, 8, 13 and 8-inch Triple Engine with Radial Valve Gear.

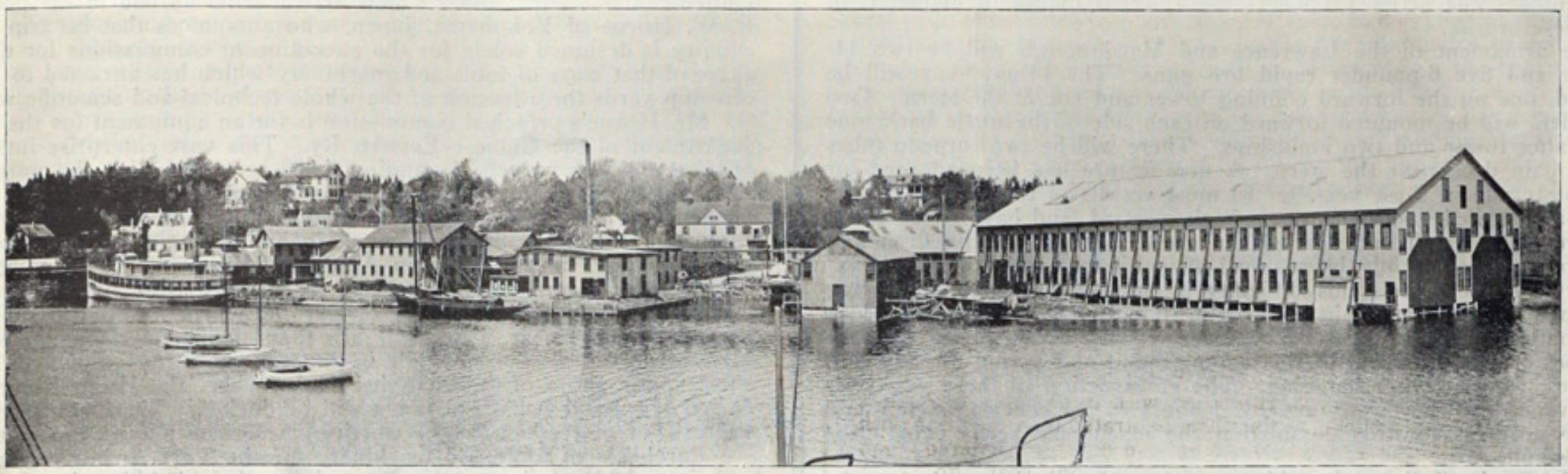
PRODUCTS OF THE FORE RIVER ENGINE CO., WEYMOUTH, MASS.

living space and forward of the boilers. There are no openings in any of the bulkheads, communication from one part of the vessel to another being only by way of the deck above. Any two of the compartments might be flooded at the same time without the vessel's foundering. There are two conning towers, of nickel steel. The steam steering engine is placed in the forward tower, and there is a steam and hand steering gear in both the conning towers and likewise on the bridge.

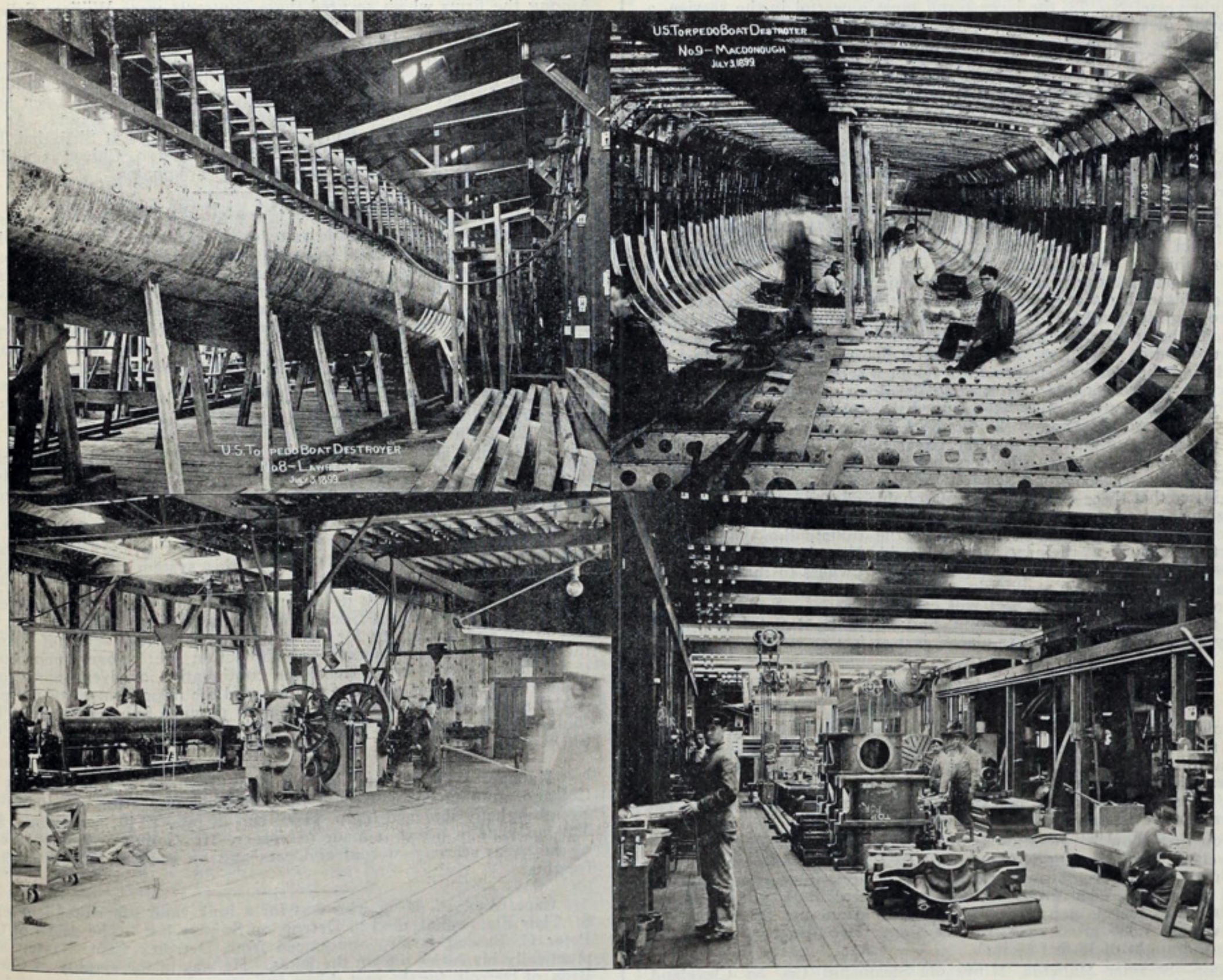
The general arrangement is as follows: The machinery and boilers are located in four separate watertight compartments amidships; the two after compartments are for the engines, the starboard engine being forward. There are four boilers, two in each compartment, having athwartship fire rooms. The officers' quarters are forward and the crew's quarters aft. The total accommodation is sufficient for a complement of eighty men.

Engines are of the vertical, inverted, direct-acting, triple-expansion type, having a high pressure cylinder of 22 inches diameter, an intermediate cylinder 31 inches, and two low pressure cylinders of 34 inches diameter each, with a stroke of 20 inches. The engines are designed to develop 8,400 horse power at 360 revolutions, using steam of 240 pounds pressure. The cylinders are of gun iron, which gives an excellent wearing surface, and, at the same time, allows the cylinders to be made lighter without impairing their strength. This metal shows a tensile strength of about 34,000 pounds per square inch. The arrangement of the steam ports of these engines merits special mention. The cylinder heads and valve chest covers are in one casting containing the port, which is large but very short. This arrangement gives the minimum clearance possible for this type of engine, and also makes the cylinder castings much more simple and much less liable to defects. No stronger emphasis can be laid on this fact than to mention that out of sixteen cylinders cast for the destroyers not one was rejected by the government inspectors. The cylinders are supported on nickel steel columns, so braced that the vibration at the highest speed shall be the very least possible. These columns are of steel having a tensile strength of 95,000 pounds per square inch.

Boilers are of the water tube variety with bent tubes, and are made from the special designs of the Fore River company. Each boiler has one steam and three water drums, each drum being large enough to allow a man to enter. This arrangement gives two furnaces with a wall of tubes completely isolating each furnace. The total grate surface of each



GENERAL VIEW OF THE PLANT OF THE FORE RIVER ENGINE CO., WEYMOUTH, MASS.



INTERIOR VIEWS OF FORE RIVER ENGINE CO.'S PLANT, WEYMOUTH, MASS.

boat is about 320 square feet, and the heating surface 19,000 square feet. The working pressure is 300 pounds per square inch. Forced draft, supplied by four steam-driven blowers, two in each of the boiler compartments, is used. The compartments can be closed and a pressure of about 4 inches of water maintained. The coal bunker capacity is 200 tons, sufficient to enable the vessel to steam 3,000 miles at 14 knots, or 1,000 miles at 30 knots. The screw propellers are 7 feet 3 inches in diameter, of manganese bronze.

The armament of the Lawrence and Macdonough will be two 14-pounder and five 6-pounder rapid fire guns. The 14-pounders will be mounted, one on the forward conning tower and one at the stern. Two 6-pounders will be mounted forward on each side of the turtle back, one on the after tower and two amidships. There will be two torpedo tubes on the main deck near the stern. A new feature has been adopted for torpedo storage in these vessels. In most vessels of this class, the torpedoes are stowed under the turtle back forward, and have to be taken out through a hatch and carried the vessel's length to the discharge tubes, often necessitating the removal of ventilators and other deck fixtures. On these vessels this difficulty is entirely overcome by storing the torpedoes in a watertight compartment located under the main deck close to the discharge tubes. The torpedo crane is so placed that the torpedoes can be lifted out of this compartment and swung directly into the tubes, without other handling. The construction of these vessels is well advanced, as they were on Nov. 1 about 65 per cent completed, and in their progress towards completion the machinery keeps equal pace with the hulls.

The efforts of all naval architects and marine engineers during the past ten years have been directed towards lessening the weight of marine machinery as much as is consistent with strength, and to this feature in the construction of its vessels the Fore River Engine Co. has devoted especial care and attention, making the forgings for the engines of the highest quality of nickel steel, which, together with superior gun iron for cylinders, has allowed a large reduction in weight, while in their hull construction the high grade nickel used has permitted great economy in weight and bulk, affording, at the same time, equal or greater strength.

It may be added that the Fore River Engine Co. was recently awarded the contract by the United States light-house establishment for the steam steel light vessel No. 72, the largest and most powerful in the service, a description of which was given in the Review of May 25, 1899. This vessel is to be stationed off Cape Hatteras.

BUFFALO TUG OPPOSITION.

Referring to the tug competition from Maytham interests in Buffalo, one of the officials of the Great Lakes Towing Co. says:

"All the talk of opposition at other ports comes from the people who sold out at Buffalo and who are again going into the business. Vessel men are fair and their sympathies will not be with the fellow who makes a straight bargain and then in a round-about way goes back on it. But aside from this feature of the Buffalo affair, it is fully understood that one of the main objects of the formation of the towing consolidation, the stock of which is owned almost entirely by vessel owners, was to secure to the vessels the very best of service at fair charges, and to overcome unreasonable charges at some ports where the vessel men thought they were not rightly treated. On this latter score Buffalo was complained of very much before the consolidation. It is the intention of the officers of the consolidation to adjust this matter of charges for all ports on the lakes during the coming winter and to adopt a schedule that will be uniformly fair and reasonable. This would be done now but there are too many other matters that must have immediate attention in picking up the ends of a large organization of this kind. I do not mean by this reference to an adjustment of charges, that the Great Lakes Towing Co. is not to return a fair profit to its stockholders, but it is fully understood that, having first of all secured good service, the vessel owners controlling the tugs will see that there shall be no unreasonable charges, as that would be against their own interests. This kind of a broad policy must be carried out by an organization like ours, and as the Buffalo line managers so understand it, such of them as are not stockholders in the towing company will undoubtedly act with the other vessel owners to that end. The service that will be given at Buffalo with a few more good tugs added to the Great Lakes company's fleet will certainly leave no room for complaint from vessel men at that point, and it will be the aim to provide equally good service at all other places, just as fast as we can get around to it."

CARGO RECORDS OF THE GREAT LAKES.

Now it is the Minnesota Steamship Co.'s new steel barge Manila that holds the record for the largest cargo ever moved on the great lakes. She has just delivered at South Chicago from Two Harbors on even 18 feet draught a cargo of 7,479 gross tons or 8,376 net tons. These are actual weights which are 1 per cent above bill of lading figures. The cargo record revised to date, is as follows:

Iron ore—Tow barge Manila, owned by Minnesota Steamship Co. of Cleveland, 7,479 gross or 8,376 net tons, Two Harbors to South Chicago, draught of 18 feet even; tow barge John Smeaton, Bessemer Steamship Co. of Cleveland, 7,446 gross or 8,339 net tons, Duluth to Cleveland, draught of 18 feet 1 inch; steamer Malietoa Minnesota Steamship Co. of Cleveland, 7,335 gross or 8,215 net tons, Two Harbors to South Chicago, draught of 18 feet ½ inch.

Grain—Steamer Malietoa, Minnesota Steamship Co. of Cleveland, 195,396 bushels of flax seed and 70,000 bushels of wheat, equal to 7,571 net tons, Duluth to Buffalo, draught of 17 feet 8 inches; steamer Superior City, owned by A. B. Wolvin of Duluth, 266,550 bushels of corn, equal to 7,463 net tons, South Chicago to Owen Sound, draught of 18 feet 2 inches; steamer Andrew Carnegie, Wilson Transit Co. of Cleveland, 332,100 bushels of oats, equal to 5,313 net tons, Manitowoc to Buffalo.

Coal—Steamer Hendrick S. Holden, Capt. John Mitchell and others, Cleveland, 6,432 net tons of anthracite, Buffalo to Duluth, on a draught of 17 feet 8 inches forward and 17 feet 1 inch aft.

THE WORLD DEMANDS AMERICAN SHIP BUILDING MACHINERY.

American ship building tools are rapidly forcing themselves into the markets of all parts of the world. Last week the Review told of large orders of ship building machinery for which the most prominent Italian ship building corporation had just placed contracts with firms in the United States. Now comes a new arrival from abroad in the person of F. W. Horne of Yokohama, Japan, who announces that his trip to this country is designed solely for the execution of commissions for the purchase of that class of tools and machinery which has attracted to American ship yards the attention of the whole technical and scientific world.

Mr. Horne's principal commission is for an equipment for the marine department of the Chinese Eastern Ry. This vast enterprise intends to operate eighteen vessels, averaging 4,000 tons each, for the purpose of carrying freight from Shanghai to Port Arthur and Vladivostock. Large repair shops will be constructed at Port Arthur, and the Russian officials stipulated that the entire equipment, including engines, boilers and machinery should be purchased in America. How much of a compliment to American manufacturers is found in this provision may be imagined when it is stated that a number of European firms offered to supply the needed equipment at a lower figure than their American competitors. Mr. Horne will also order while in America an entire equipment for the construction shops of the Shanghai docks, where the Hong Kong Maru, Nippo Maru and American Maru will be docked. These contracts alone will call for more than $50,000 worth of American pumps, tools, etc.

Purchases of tools and machinery for the Port Arthur repair shops will foot up to at least $150,000, and in all probability the figure will be much nearer $200,000. Mr. Horne has already placed an order for $12,000 worth of equipment with the American Tool Works of Cincinnati; William Sellers & Co. have $10,000 worth of contracts, and every prominent machine tool manufacturing concern in the United States will furnish one or more special machines. As evidence of the trend of things in the export trade of American ship building machinery it may be noted that when tenders were recently invited for the equipment of the construction shops of the Uraga docks, the specifications were drawn up for a supply of English machinery throughout, but eventually nineteen out of the twenty-one machines were ordered from American manufacturers. Among the firms which secured these contracts were William Sellers & Co. of Philadelphia, the Fay & Egan Co. of Cincinnati and the Bickford Drill & Tool Co. of Cincinnati.

That Mr. Horne himself has implicit confidence in the future of American tools and machinery in the foreign market is eloquently attested by the fact that he is now making arrangements to open branch offices in Calcutta, Bombay, Singapore, Rangoon and Manila. At present the interests which he represents maintain offices at Shanghai, Hong Kong, Canton, Port Arthur, Tien Tsin and Chefoo, China, as well as a $100,000 exhibit of American machinery at Yokohama.

IMPROVEMENT OF INLAND WATERWAYS.

The improvement of inland waterways of America is just now being agitated by conventions and gatherings of various kinds. The convention on deep waterways recently held at Peoria, Ill., was the first of these, and that gathering placed Chicago and the people of the Illinois valley on record in favor of a deep waterway to the gulf. Resolutions were passed declaring that the advanced stage of the work on the sanitary and ship-canal of Chicago justifies the immediate co-operation of congress with a view to the early completion of the waterways between the lakes and the Mississippi, and in urging the supreme utility of this waterway it was declared that a large flow of water from Lake Michigan was necessary to its adequate development. The removal of the federal dams in the lower Illinois is requested.

At the fifth annual convention of the Ohio Valley Improvement Association, recently closed at Louisville, a resolution was passed asking congress to appropriate sufficient money to build locks and dams to make the Ohio continuously navigable to its mouth. States and cities along the river are requested to legislate to reduce wharf charges. The continuous contract system of appropriations for rivers and harbors was indorsed and congress asked to adopt this system on locks and dams between Pittsburg and Marietta, not yet contracted for.

It has been definitely decided that the convention of the Western Waterways Improvement Society will be held at Memphis, Tenn., Nov. 14 and 15, and invitations for the gathering have been sent out. Among the principal subjects to come up for action are: Government control of the levees of the lower river; the continuation of river improvements under the continuous contract system; and the improvement of the passes at the mouth of the Mississippi so as to permit of the entrance of large ships without difficulty. A channel to New Orleans having a depth of 35 feet is wanted.

Manager J. T. Connery of the Youghiogheny & Lehigh Coal Co., Chicago, announced on Nov. 1 the following prices for steamboat fuel: Youghiogheny screened lump, $3.50; run of pile, $3.40; screenings, $2.50. This advance in prices is made necessary, Mr. Connery says, on account of the great scarcity of coal and cars and on account also of advanced freights.

Capt. Wm. H. Mott, who was for a long time superintendent of the St. Clair Flats canal, died in Detroit on Sunday last. The death of Capt. Peter C. Bassett is also announced from Detroit. Capt. Bassett spent practically his entire life on the lakes. He was in the employ of Candler Bros. of Detroit, for the past thirty-one years.

Mr. John S. Thomson, well and favorably known to almost everybody who has at any time had business with the Plant line of steamers, has been appointed assistant manager of steamships with headquarters at 12 West Twenty-third street, New York City.

The old steamer Maine, recently rebuilt and now owned by Wm. Avery and others of Detroit, is given a valuation of $18,000 and A2 rating in the November supplement to the Inland Lloyds Register.

REAR-ADMIRAL MELVILLE'S REPORT.

THE ENGINEER-IN-CHIEF OF THE UNITED STATES NAVY PRESENTS RECOMMENDATIONS OF VALUE IN CONNECTION WITH A RESUME OF THE YEAR'S WORK.

The annual report of Rear Admiral George W. Melville, chief of the bureau of engineering, navy department, has just been presented to Secretary Long. The report says in part:

"The general lessons from the war were in no way indicative of any desirable change in the machinery of our ships, with the exception of increasing the evaporating plants, and the adoption with all practical and economical promptness of the water tube type of boilers. The matter of increasing the evaporating plants has been expeditiously accomplished, and at present these individual plants on shipboard are about equal to any anticipated emergency. As regards the adoption of the water tube type of boiler, the bureau is progressing with such proper speed as is necessary to avoid mistakes and to obviate sacrifice of still useful boilers of the older type. As fast as the present outfit of Scotch boilers becomes unreliable or inefficient the newer type is being substituted. This has obtained already on the Alert, Atlanta and Chicago, and a further substitution of Babcock & Wilcox type of water tube boilers for the old Scotch boilers on the Cincinnati and Raleigh is in active progress. These steps are important and are the direct results of the unqualified success of this type of boiler on the Marietta and Annapolis in our own service and on various other ships not of the navy, and renders their adoption, to the extent already made, absolutely safe. Much interest also attaches itself not only to the trials of the battleships now building which will have the Niclausse and Thornycroft types of water-tube boilers, but especially to the future preservation of the several types of these boilers during the years of that ordinary naval service which will not call for more than a very limited use of the entire plant. The status of water tube boilers at the present time is much more doubtful regarding the possibilities of protection from deterioration while not in use than regarding their efficient output during actual service. This ability or inability to properly protect such boilers is of most vital importance, and largely governs the annual cost of repairs to naval machinery.

"I would call attention to the completion of the Rainbow as a second distilling ship and also to the success with which the Iris, the first distilling ship, has been operated. This latter is noted under a separate heading in the full report.

"While not desiring to allude prominently again to the Vulcan or its work as a repair ship (the subject having been fully exhausted in my last report and in the public periodicals), I cannot pass this by without again urging the advisability of properly designing and building a repair ship, which, while being constructed with a view to the utmost efficiency for such service in times of emergency, may be retained without use (in ordinary) and without serious deterioration for many years. The promptness with which the Vulcan was fitted up during the first excitement of the war does not indicate that a waiting policy is the wisest one, for by accident alone the absolutely necessary work demanded of that ship was well within her capacity. There is no good reason for failing to provide a ship which would be even far more efficient than the Vulcan was and one perfectly self-sustaining in any climate or location. The Vulcan herself proved to be of but temporary fitness, as, after the war, the hull was found to be in such bad condition as to make it proper to strip the vessel and effect her sale.

QUESTION OF CONSOLIDATING BUREAUS.

"I must earnestly invite your attention to the status of steam and mechanical engineering of today. Various outcroppings in the shape of electrical, hydraulic and pneumatic specialties divert the thoughtless into considering these fields fundamentally separate from that of steam engineering, while the fact remains that the man educated fully in 'steam engineering' is in the very front rank of the advancing workers in all of such specialties. The principles of the side branches are of extreme simplicity, those governing the construction of the mechanisms being essentially the same as in good mechanical engineering. It is only necessary to push aside the more or less plausible superficialities which would lead to a misjudgment of these facts and look for a moment upon the real requirements to realize how fundamentally important and distinct are the duties of a mechanical bureau, and also to be convinced of the wisdom of using every exertion to provide the highest special talent for its future operation. I regret the matter of combination of bureaus has been even speculated upon. This regret, I assure you, in no way comes from motives other than the belief in the impossibility of a successful issue of such a scheme. Not only is the trend of modern mechanical work in all branches toward increased specialization, but the wisdom of such a trend is never questioned by the leading talent in the outside world of constructive work.

"While the bureau is unable to foresee the governing policy most desirable in the future at the several newly acquired naval stations, it cannot but recommend that immediate steps be taken for establishing moderately large repair plants at each of these under this bureau. I have included in my estimates a request for an appropriation of $25,000 each for the naval stations at Porto Rico and Honolulu, and have already taken steps to supply the naval station at Cavite with additional tools to those found there. The matter of further fitting up the station at Havana is under advisement, but no immediate steps are considered urgent owing to the proximity of that station to Key West. The present buildings at the Porto Rico station are substantial, and I consider it especially important that proper tools should be installed there. In connection with the Island of Guam, this bureau has taken up the matter of supplying a distilling and refrigerating plant, but does not at present recommend any further installation of engineering material, owing to the uncertainties of the future."

ELECTRICALLY-DRIVEN AUXILIARIES.

Considerable space is devoted in the report to the discussion of electrically-driven auxiliaries. It is stated: "The advantage claimed for electric motors over small steam engines on board ship may be classed as greater ease of operation, avoidance of heat, which accompanies the use of steam pipes in living places, and much greater economy. Against these, however, are to be put the much greater weight of the necessary electric outfit, the greater delicacy of the type of electric motors ordinarily used, the lack of ready adaptability to the various conditions of service, a general denial of the claims for economy as ordinarily presented, and the increase in the amount of space required below the protective deck for the installation of the necessary dynamo rooms, this space being necessarily taken from coal bunkers." Objection is made to a change of motive power involving great increase in weight, unless the advantages gained are very material. A protest is made against the statement that the enormous gain in economy claimed for the electric drive of the auxiliaries, which is obtained by taking the highest figure for the efficiency of the generator and motor and also the most economical steam engine, and by comparing these results with the uneconomical form of steam cylinders which, for very good reasons, have until recently ordinarily been used with the steam-driven auxiliaries. It is emphasized that the objection to using electric motors for driving the auxiliaries on board ship is not an objection to the use of electric motors per se, but to installing them in a location for which they are not adapted and where their good features can not be utilized. It is stated in this connection: "It must also be noted that all the published statements of the superior economy of electrically operated auxiliaries are based on steam auxiliaries where every steam cylinder was of the least economical kind, and where, for good reasons, well-known measures of economy had not been installed. An inspection of the bureau's recent designs will show that by the use of compound engines as motors, feed heaters for the exhaust, the use of the exhaust steam from the auxiliaries in the receivers of the main engins, and other economical devices, the expenditure of steam in the auxiliaries is brought much below that of the old simple engines, and indeed below that of the electric drive except under very favorable conditions, while avoiding the increased complication and weight which necessarily accompany electrically driven auxiliaries on board ship. I may be permitted to call attention in this connection to the fact that those designers abroad who have the most extended experience are working on this problem of the economy of auxiliaries along the same lines that the bureau has been following. Although the statement is very often made that the electric drive of the auxiliaries is being rapidly adopted in all foreign navies, this is far from accurate. It is being tried on some ships in some navies, but is as yet entirely in the experimental stage. These experiments have been carried quite as far in our navy as in any other. I think I may be pardoned for saying that those who are most insistent on the electric drive are not at all conversant with the conditions obtaining on board ship, while those of us who have spent a lifetime in the care and design of naval machinery may fairly claim that we know something about what is needed. It is perfectly safe to say that when electric machinery can be used more advantageously than steam for driving ships' auxiliaries the change will be made very promptly. Knowing, as they do, that as at present designed electric machinery, however good elsewhere, is not yet adapted to driving the auxiliaries on board ship, the bureau chiefs would be incompetent if they yielded to the craze for new things and made a change which would result in increase of weight and complication, lack of economy, dissatisfaction and the decreased efficiency of the fleet.

"This loss in weight and space would be very much decreased if the size of the electric generating units could be largely increased without loss to the efficiency of the ship. At present, however, it is necessary for the efficient operation of the turret-turning machinery and of the ammunition hoists that small units be used, for these purposes at least. Probably when the designers of electrical machinery for naval use give as much attention to the development of designs to suit naval conditions as they have already done in commercial work this necessity will be overcome. I consider that the turbine engine has a distinct field as an electric generating engine, especially on shipboard. When the design of naval electrical machinery is sufficiently advanced to justify the use of large units the advantages of turbine engines will cause a great saving in weight and space. The operation of electrical machinery is purely mechanical. That this may be done efficiently requires good mechanical ability at the generating engines. Electric difficulties and casualties are almost always questions of mechanical engineering. I know that it would conduce to the efficiency of the service, to the feasibility of a more extended use of electricity, and to an increase in the life of electrical apparatus if the electric generating plant were placed in charge of this bureau. I therefore recommend that this change be authorized. I desire to call your attention to the fact that it is almost the universal commercial practice to place electric generating plants in the charge of mechanical engineers."

CAPT. WATKINS' SENTENCE MODIFIED.

Capt. G. H. Starbuck, supervising inspector of steam vessels in the New York district, has modified the decree of the New York local board of inspectors and reduced from two years to six months the suspension of Capt. Frederick H. Watkins, who was in command of the American liner Paris when she stranded on the Manacles rocks. In shortening the term of suspension Capt. Starbuck wrote Capt. Watkins as follows:

"I have taken into consideration your appeal, dated Oct. 18, 1899, asking for a mitigation of the penalty imposed on you by the local inspectors at New York, who suspended your license on July 15, 1899, for two years for not acting with necessary care and attention in the navigation of your vessel, the steamship Paris, which was stranded on the English coast on May 21, 1899, the suspension by the local inspectors to commence from the time the license was received by them, which was Sept. 9, 1899. I concede that the accident was caused, as you state, in transcribing from the rough log to your pocket memorandum, the time of passing La Hague and that it was not an error due to incompetency or lack of skill in your profession; a successful career of many years disproves that. Taking in consideration the many mitigating features in your case, I hereby, as per authority conferred upon me by section 4452, United States revised statutes, modify the decision of the local inspectors at New York, who suspended your license for two years, to suspension for six months."

OUR MERCHANT MARINE UPON THE OCEANS.

BY HON. GEO. F. EDMUNDS, EX-SENATOR FROM VERMONT.

The Marine Review sent a special invitation to the Hon. George F. Edmunds, ex-senator from Vermont, for an expression of his views on the condition of our merchant marine upon the oceans and the movement for its restoration. Senator Edmunds needs no introduction to the readers of the Review. His long and honorable career in the United States Senate is a valued and permanent part of our national history. His views are expressed in a communication published herewith, and they are sure to command respectful attention from all those interested in the welfare of our whole country.

Editor Marine Review:—I have your courteous note of the 23rd inst. inviting me to give my views on the topics mentioned in your circular concerning our merchant marine. Before expressing my opinion on the subject it is right that I tell my countrymen who may honor me by reading what I have to say, that I have been and am still the counsel of a committee of ship builders, ship owners, merchants and manufacturers who are endeavoring to promote the increase of our foreign trade, in respect of what congress may properly do in view of the constitution and of the great number of treaties existing with other Powers—which matters seriously affect the question. I suppose I was honored with this duty because it was known that during a rather long service in the Senate of the United States I had been in favor of taking measures to bring our carrying trade back into our own hands and by that means to increase the exportation and sale of all the abundant productions of our country, beginning with the farm, the mine and the forest, and running through all our manufacturing industries to the very last and finest fabrications that have from the first crude material gone through the hands of thousands of different workmen and have increased in value a thousand fold. It is this working up of raw material and selling the final product that produces national prosperity and wealth, which means the gains and savings of the men and women, from the first to the last, who contribute to or do the work. The factory can do nothing without the first and essential aid of the farm, the mine and the forest. The workmen can do nothing without the mills, tools and other appliances of all sorts, nor without fair and prompt pay. They must support themselves and their families in comfort and educate their children. Their employers cannot pay them unless they can find markets for and sell the goods so made. Therefore, the more extensive and varied the markets the greater is the opportunity for all these co-operative works to go on successfully. All this is self evident, but, like other important self evident truths, it cannot be too often stated, for on it depends the whole co-operative life and happiness of a nation. Thus it is manifest that every occupation and every accumulation of capital in our country have a common interest in promoting and increasing our export trade. How, then, can this best be done?

The producing and commercial classes of other nations know and have known for a long time how they can best achieve these large ends for themselves. They and their governments know that the only effectual way is to have the means of transportation their own and always in their own control both in peace and in war. They know that in time of peace the flag of their own country at the masthead is a constant guaranty of safety and respect, and also that it is a continual and free advertisement of the goods their ships carry, as the production of their country. No farmer would, if he could help it, send his produce to even the nearest market by the wagon of his neighboring farmer or any other conveyance whose owner had the same sort of things to sell; he knows that if he would find the best customers and get the best prices he must run his own wagon or control his own means of transportation. The farmer, the miner, the manufacturer and the merchant each and all are in the same case. In our own country and among themselves they know this perfectly well and act upon it the best they can. Any man, any country or any nation that trusts his or its competitor to do any part of his business is sure to fail in the end. All the farmers, all the miners, all the manufacturers and all the merchants, etc., make up the family of the nation, for a nation is nothing else than a union of all these really co-operating families. Just like a single personal family they must co-operate or else the family will grow poor in comparison with the neighboring family of which all its members try to help each other.

What, then, are we to do in order to restore in common to all our people the full and best benefits of trade in those foreign markets which may need our produce and our manufactured articles of all kinds? That our own means of communication and transportation are chiefly necessary the experience of centuries among all nations has proved to be true. A single illustration (among scores that might be referred to) of this truth may be stated. It appears in British history that our forefathers in the colonies had become "the carriers for all the colonies of North America and the West Indies," and that as a consequence the British home manufactures, as well as those of the Dutch, etc., were being pushed out of the markets and the produce and manufactures of our colonies carried in. So measures were taken by the British king and parliament to grant monopolies to British companies to trade in the West India islands. It may be stated broadly that the nation which has the quickest and best means of communication, under its own flag and authority, with other nations, will surely have the best share of foreign trade. As I have said, the flag of a country at the masthead of its ships is a great advertisement of the productions it has to sell, just as in every town of our country the name of the producer, the manufacturer and the merchant on his wagon that delivers his goods is. There are only three possible ways of reaching the end of putting our country, for all its people, on a fair footing with other countries in the respects before mentioned:

First, discriminating duties. This method in view of our treaties with many other nations would take a long time to put in operation—so long that the trade would become still more firmly established in the hands of our competitors; and if adopted, it would be likely to lead to countervailing discriminations by other governments. Recent experience also has shown that very powerful and perhaps controlling influences would very likely be able to prevent the adoption of discriminating duties, even in cases where no treaty obligation stands in the way.

Second. It has been suggested that a bounty on the exportation in foreign as well as American vessels of the products of the farm, such as wheat, corn, etc., should be provided for by congress. Such a scheme would, I think, prove wholly illusory. In the first place, the producer, whose crop goes through the hands of the middleman and the shipper, will surely find that he gets no more for his crop than he would without the bounty, and that the middle man, the shipper and the foreign market agent have taken all the bounty, and that the treasury of the United States, which is his treasury, has been exhausted to that extent with no good to him. In the second place, it is perfectly plain that no law can be passed to give this bounty. The producers, the manufacturers and the laborers are all co-operative parts of the whole national family and no one class can or ought to be favored without the other. But it may be answered that we have given bounties to the fisheries and to the producers of sugar; so we have. As to the fisheries, the bounties were given because we must have for national defence a portion of our citizens always taught and skillful in ships and the work of the sea so that our navies might find ready the men to carry our flag to victory, as at Manila and Santiago, and in other like emergency that for the present age is likely to come to every nation. As to the sugar bounty of a few years ago, it was given in order, if possible, to diminish the enormous drain on the earnings of our own people in buying foreign-grown sugar. If, for example, only one-tenth of the wheat, corn and pork consumed in the United States were produced in our country nearly every citizen would favor any law tending to increase home production. Happily for us, our farms, mines, forests and manufactured productions do not, in general, fall into these classes. All are abundant, and in every part of our country almost all things necessary to the comfort of our people can be produced, and thus every interest is reciprocally common with every other. A bounty, therefore, on the exportation of the particular products of one kind of industry would be an invidious distinction against all the others.

Third. Postal subsidies have been suggested as an adequate means to aid in the restoration of American shipping. Such subsidies are undoubtedly useful, as other nations have found, but they are only useful or, indeed, possible as auxiliary aids to merchant vessels carrying cargoes, and, except on great and established lines of transportation, it would be absolutely impossible to give postal subsidies sufficient to enable the vessels to run.

Fourth. The only other method to the great national end that almost everybody professes to be for is the one, substantially, contained in the measure proposed in the last congress. That measure has been so much misunderstood by some of those citizens who wish to increase our shipping interests, and so misrepresented by those who, from whatever motive, desire to prevent anything being done, that it is proper to state, concisely, exactly what the fundamental features of the measure were.

1. It provided for the systematic payment, limited to a definite period of time, of a sufficient compensation, and only a sufficient one, to American vessels sailing to and from foreign ports, in order to enable them to perform the voyage with a fairly full cargo of American productions, and returning with a fairly full cargo of imports. Without these cargoes, the ship owners could not afford to make the voyages and thus get the compensation. The effect, therefore, would be to help carry American cargoes in American ships to every foreign port where such cargoes could possibly be disposed of and thus to open American trade in ports where American vessels are now almost never seen, and where very few American products are now sold, as well as to increase our trade in ports and countries where we already have some trade carried on in foreign ships

A SHORT NOTE FROM ADMIRAL SCHLEY.

THE EVERETT,
WASHINGTON, OCT. 24, 1899.

I am heartily in favor of establishing the merchant marine of the nation upon the surest foundation, but I am so pressed with business matters at this time that I find it is not possible to write an article, though I feel heartily in sympathy with those who desire its upbuilding.

(Signed,) W. S. SCHLEY.

and always under the influence of foreign prejudice and foreign competition.

2. This first and main provision made the business and the compensation open to every American ship builder, every American ship owner and every American industry. There could be no trusts, pools or syndicates, inasmuch as the sea is open to all, and a single ship with its cargo would be absolutely free and independent. No line or combination could be favored, as they usually must be and almost always are when subsidies are given to particular lines for carrying the mails, etc., etc.

3. The treasury was guarded by the fact above stated that the vessels could not run without carrying a paying cargo, for the compensation was so small that the cargo was indispensable to the profit of the voyage; and the sending of the cargoes is the very thing that the people of the United States need to accomplish.

4. The bill required that the ships built and used for these purposes should be capable of naval use in time of need and could be taken at any time by the United States for that purpose.

5. The bill also provided for these vessels taking and educating a certain number of American boys in the various branches of seamanship, so that if the vessels should be able to operate with the aid provided there would always be a large and increasing number of Americans who would be able in time of need to defend the interests of our country.

6. The bill also provided that all these vessels should carry the mails of the United States, whenever required, free of charge; and thus direct communication by postal facilities would be established to every port where these compensated vessels should go.

7. The bill also provided that no arrangements should be made under it after ten years from the passage of the act, and it also provided for various and exhaustive limitations and safeguards in the interest of the public service.

The foregoing is, in substance, a statement of the main and important features of the scheme. If we are really in earnest in wishing to take measures to increase our foreign trade and dispose of the vast and increasing amount of our surplus products by having the whole business, as far as possible, in our own hands, protected and advertised by our own flag, and put ourselves in a strong and undisturbed position in case of wars between the powers which now possess the chief carrying trade of the globe, and if we wish to do it in such a way as to help all citizens alike without favoritism or partiality, I know of no means so sure to accomplish it as the scheme above described. The state of commercial competition for foreign markets between the producing and manufacturing nations is growing more and more intense, and if anything is to be done to put the United States on a secure footing it should be done quickly. Other nations are perfectly right in taking every peaceable means to increase the markets for the sale of the productions of their citizens; but while our carrying trade remains in the hands of other nations our export trade will always be at a disadvantage, and in case of war between any of the principal powers would be in danger of being most injuriously broken up or obstructed unless we shall have our own ships and our own flag to carry it on and protect it.

GEO. F. EDMUNDS.

Philadelphia, Oct. 27, 1899.

BUFFALO VIEW OF THE NIAGARA DAM SCHEME.

Buffalo, Oct. 31:—I read with much interest the report in the Review of the address made in Cleveland lately on the deep-water problem and the proposition to dam the Niagara in the interest of this undertaking. Of course Buffalo is severely opposed to a ship canal to the sea and has no idea that it will ever be undertaken, but the fact that the dam portion of the plan relates only to a greater draught of water in channels already existing, makes it a vital question to us. There has been too little explanation of the method proposed in connection with the erection of these dams, and for this reason not a few of our vessel owners and especially dock and land owners are decidedly nervous over the undertaking. Anything that would raise the lake level materially might easily produce a serious condition of affairs in our inner harbor and especially on the Buffalo creek flats, which are more or less flooded every spring. If a dam should appear likely to increase this disposition of the creek to overflow it would meet opposition here that would be pretty sure to prove fatal to it, and such is likely to be the case elsewhere, so it is time to look into the matter.

I studied the address of Mr. Wisner carefully, but without finding the amount of detail brought out that I would like to see, so, fearing that such omission would create uneasiness in certain above-mentioned quarters, I sought for independent information. It appears that the proposed dams, as shown in the plans of the deep-waterway board, are not to come to the surface of the water and will be so constructed as not to be operative in times of high water. Sluice gates enough will be provided to carry off all water above a certain amount, so that the dam would not in any case add to natural high-water levels.

It is confessed, however, that such a dam could not be constructed with sufficient capacity for rapid change to counteract the effect of a sudden change of the wind, which is capable of raising or lowering the level at one end or the other of the lake several feet and occasionally does so without any great violence in the wind, the change in the water level always taking place ahead of the change of the wind. So it is the plan to make use of these dams only in time of comparatively low water, or at least when it is not especially high. This will to a great extent set at rest the apprehension of the shore property owner, but there is another point that must be considered. The dam, whenever utilized at all, will so increase the speed of the current at the openings that it will not be safe to navigate such points without some artificial aid. And so it develops that the system of dams contemplates the erection of a lock at each opening. Here is an undertaking in engineering that we may well hesitate over. The dams can be built at moderate cost, but not so the locks. Take, for instance, the Niagara channel. A dam just below the foot of Lake Erie will require a lock and also a development of the old, and now practically disused, Black Rock harbor for some miles, as it was never deep enough to float anything drawing more water than a light barge. It has been found that the natural current of the Niagara is such that no increase of it will be tolerated, if it is to be considered in future a navigable stream. It is probable that no further outlay of money will ever be made on the upper end of the river, further than for incidental purposes, on account of the natural current.

So the general deep-water plan of a system of locks in addition to the dams is here, at least, seconded by the condition of the river. It is estimated that the work in Niagara river alone will cost a matter of $4,500,000. I am not trying to say anything of the plan, pro or con, now, but am merely trying to bring it down to something of detail, so that we may know what to expect and have a fair chance to discuss it.

JOHN CHAMBERLIN.

NEW AMERICAN BATTLESHIPS.

Although work has already commenced on plans for the new battleships authorized at the last session of congress, so many questions of design, displacement, dimensions and strength of battery are involved that it is unlikely that all the details will have been decided before next winter. A very commendable rule that is to be rigidly enforced is the conclusion that once designed these battleships will be constructed strictly on the plans mapped out, without changes and deviations of the kind that have caused so much inconvenience in the past. Some spirited clashes of opinion with regard to these new fighting craft may be expected. One member of the board of construction favors superimposed turrets, such as are to be found on the Kearsarge and Kentucky. Admiral Melville wants triple-screws, so as to provide for 20 knots as well as cruising speeds, but his confreres do not all agree with him. It is practically agreed that the main battery will not exceed 12 inches. The main argument of those who favor the two-storied turret is that it will enable the three battleships to have broadside batteries second to none in the world. This argument is based on the supposition that the vessels will each have two 12-inch guns and two 8-inch guns in each superimposed turret, two 8-inch guns in an ordinary turret on the starboard side amidships, and two 8-inch guns in a turret on the port side directly opposite. Under this arrangement, it is claimed, each vessel will be enabled to pour a broadside into an enemy from four 12-inch rifles and six 8-inch rifles, the 8-inch guns in the turret amidships on the side farthest from the enemy being the only ones that could not be used in broadside firing.

DULUTH GRAIN FREIGHTS.

Duluth, Minn., Nov. 1.—It is understood that vessel representatives here have been figuring on a contract to carry from Lake Erie ports to Duluth for a period of five years, such coal as may be purchased by the Duluth, Missabe & Northern Ry. and the Lake Superior Consolidated Iron Mines (Rockefeller interests), amounting to about 75,000 tons annually. The grain situation has certainly not been encouraging. Not more than about ten vessels have been chartered within the past ten days. The charters have been mainly wheat at 4½ to 4¾ cents with a little flax at 4½ cents. A note sent out by one of the leading vessel agencies is as follows:

"The principal activity during the past week centered about late shipments and winter storage at Lake Erie ports. In a few cases 5½ cents was paid, but offerings of tonnage under this proposition soon exceeded the demand. Considerable tonnage was placed for opening shipment, 1900, at 3½ cents. We feel rather discouraged with the outlook. The three largest wheat shippers have ceased attempting to sell grain. Our wheat has been offered half a cent less in Buffalo than it can be delivered at that port. Coal supplies are about 175,000 tons less than a year ago, the principal shortage being in bituminous."

NEW FRENCH LINER.

The new French liner La Lorraine, which will be placed on the Havre-New York route in the spring, has been launched at St. Nazaire. She is 580 feet 8 inches long, 60 feet 2½ inches beam, 39 feet 4 inches deep, and displaces 15,000 tons. She has five decks. Her engines are of the triple expansion type, with four cylinders, 22,000 indicated horse power and a working steam pressure of 165 pounds to the square inch. The machinery space, including bunkers, will occupy 58 per cent. of the length of the ship. She is fitted to be used as an armed cruiser, having mountings for nine 5½-inch quick-firing guns and eight 1.47-inch quick firers. It is said that the appointments for passengers are to be most luxurious and comfortable. There will be three kinds of first-class passengers, viz.: "grand luxe," "luxe" and ordinary first-class; 59 of the first two classes can be accommodated, 378 ordinary first-class, 118 second-class and 398 emigrants, making a total of 953, which, together with the crew and stewards, make a grand total of 1,325. The speed of La Lorraine is to be 22 knots.

The revenue cutters Algonquin, Onondaga and William Windom have recently been supplied with alco-vapor launches instead of the steam vessels heretofore used in the revenue service. On the Algonquin and Onondaga the launches are each 26 feet in length and can accommodate fourteen persons. The Windom's launch is 2 feet shorter. The Algonquin and Onondaga have not yet been fitted with bilge keels and will return to Baltimore from New York to have this done and other repairs made. It is expected that they will then proceed to their respective stations. The Algonquin will probably be assigned to Philadelphia and the Onondaga to Wilmington, N. C.

The weekly statement of new vessels issued by the bureau of navigation, treasury department, lists the steamer Hartford recently completed by the Maryland Steel Co. of Sparrow's Point, Md., as of 1488 gross and 1012 net tons burden, and the steamer Maracaibo, built by the Harlan & Hollingsworth Co. of Wilmington, Del., as of 1771 gross and 1095 net tons burden.

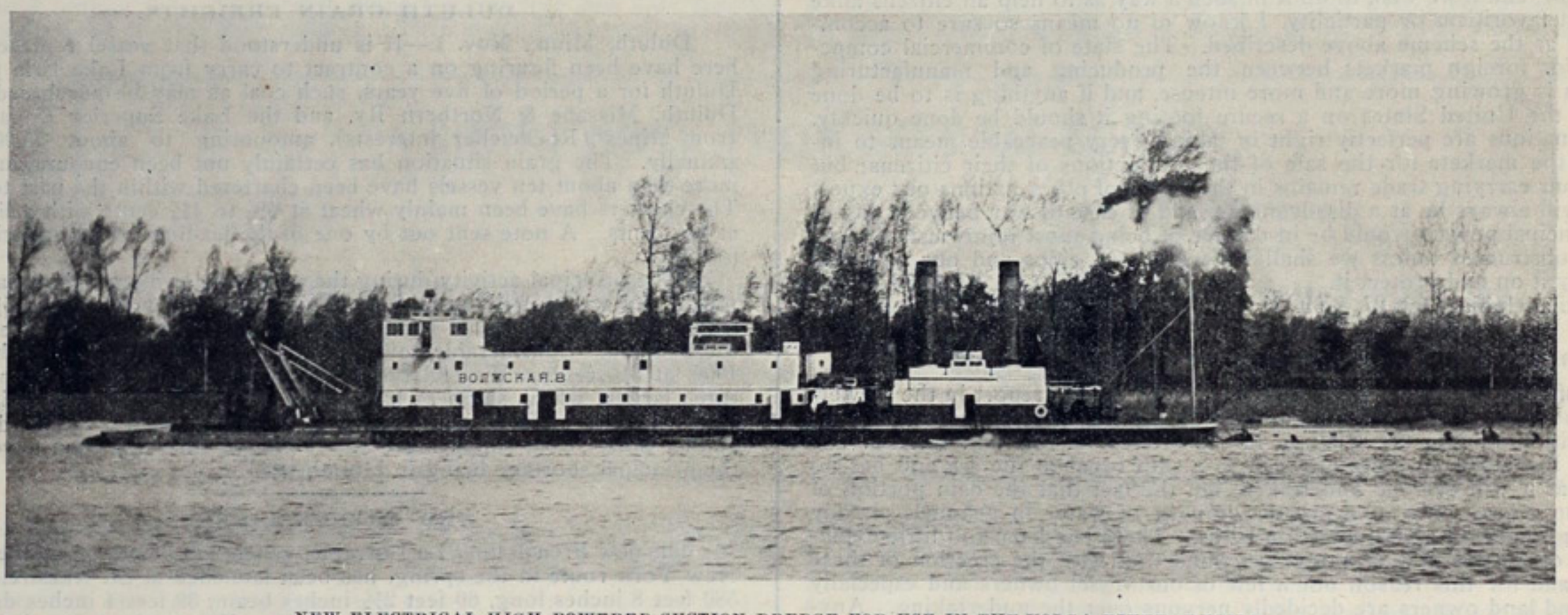
The steam collier Santuit of Boston, which was attached at Newport News some months ago to satisfy the $40,000 claim of the Knickerbocker Towage Co. of Maine against the defunct Atlantic Transportation Co., has been sold at public auction to Asa Haley and William C. Appleton of Boston, whose bid of $19,250 was the highest submitted.

IMMENSE ELECTRICAL DREDGE.

DOUBLE-HULL SUCTION-TYPE MACHINE OF FULL 7000 CUBIC YARDS HOURLY CAPACITY—DESIGNED BY AN AMERICAN FOR USE ON THE VOLGA RIVER, RUSSIA.

Increasing interest in the subject of electrical power with reference to its adaptability to vessels of various kinds insures widespread attention to everything having reference to an electrical dredge recently constructed for use on the Volga river, Russia. Distinctly unique it marks unquestionably a step in advance in the progress of this form of power. The designer is Mr. Lindon W. Bates, an American engineer who designed the dredge Beta, built some time ago for the United States government, and which has already made a record of 7,800 cubic yards of material per hour. The dredge was constructed by the Societe Cockerill of Belgium, one of the leading ship building establishments on the continent. Trials were held near Antwerp which proved highly gratifying to both designer and builders.

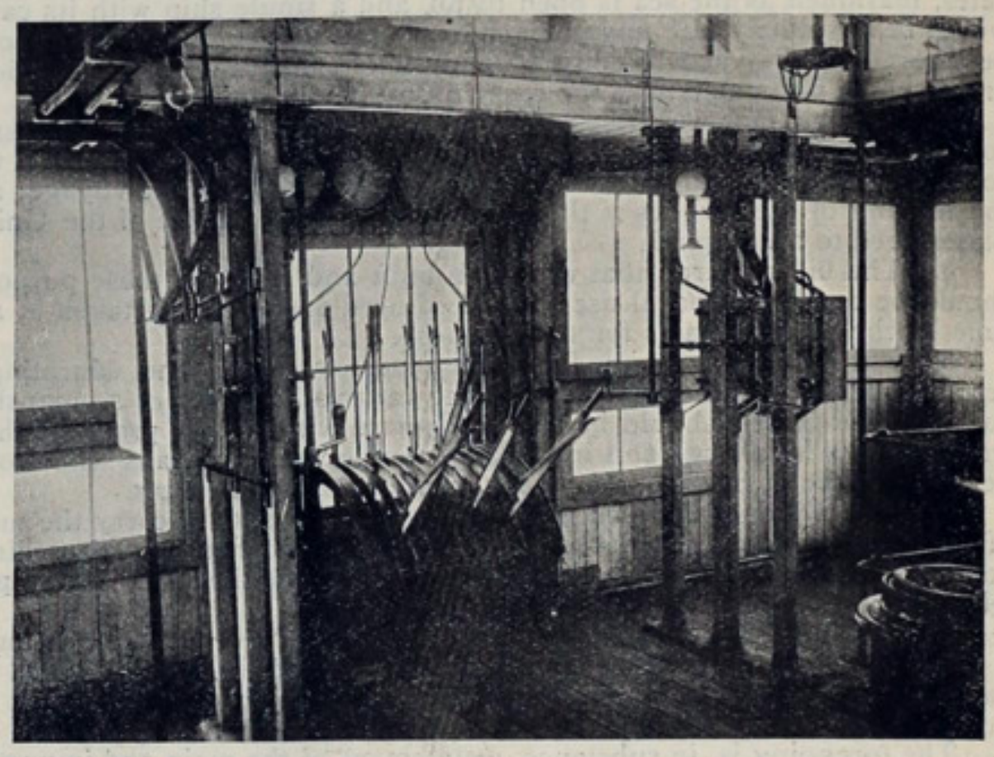
The Volga dredge is constructed really in two parts, as her beam is limited by the width of the canal system Marie, through which she must pass from the Baltic to reach the Volga. The double dredge can be operated as a whole, making a bottom cut 62 feet wide, or each half can be operated separately. Each half measures 216 feet by 31½ feet wide and 9 feet deep. At light draught, the hull draws 4 feet; the working draught is 8 inches greater. The dredge is electrically self-propelling and controllable, the electric installation of each half consisting of a 600-kilowatt generator directly connected to a fore-and-aft triple-expansion engine. The generator supplies two stern motors and two bow motors, each of 125 horse power, driving 4-foot screw propellers. The generators also supply power to the two 30-horse power motors mounted in the distributing pontoon and arranged to control the position of the pontoon line as required by operations. Lighting is done from a separate installation. Control of all motors is centralized in the pilot house. Quarters are provided for the crew and government engineers on each hull. The pipe pontoons are elliptical air jackets, reversible and not easily affected by wind, waves, or currents. Metal joints are used, as these do not obstruct the discharge stream so much as rubber connections. Each pair of compound cutter engines works four cutters. Each main-pump engine can develop 1,500 indicated horse power. The tender is a stern-wheel steamer with a speed of 10 knots an hour. The whole is manifestly much smaller than those used on the Mississippi, more effective, and can take care of more bars or miles of river than any plant heretofore devised.



NEW ELECTRICAL HIGH POWERED SUCTION DREDGE FOR USE IN THE VOLGA RIVER, RUSSIA.

HULL, PUMP AND MAIN ENGINE.

Each of the two similar hulls is built entirely of steel, with a 3-inch pine deck and a light frame deck house. Near the bow are recesses for the suction ladders and their bearings, and farther back the hull is cut away on each side to provide space for a screw propeller. There are twin screws and rudders. The interior of the hull is divided by transverse bulkheads into watertight compartments. Throughout the central part of the boat for three-fourths of its length there is a double bottom, which

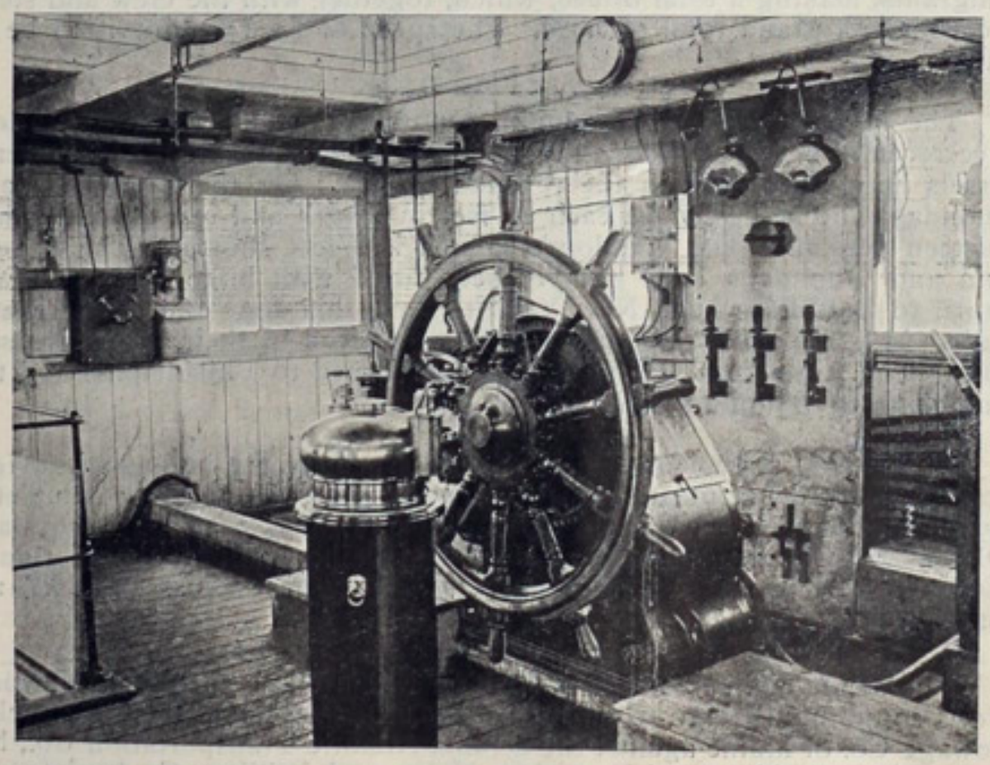


PILOT HOUSE OF ELECTRICAL DREDGE.

is in turn divided by longitudinal keelsons and water-tight floors into compartments, each of which is provided with an ejector for removing water.

The heart of the machinery plant in a craft of this kind is the main centrifugal pump, and much depends upon its proportions and power. The runner is of cast steel and the shaft is a steel forging. The casing is in iron, cast in five sections, each of which may be replaced according to relative wear. The runner will make from 150 to 180 revolutions per minute and is driven by a divided vertical triple-expansion engine, two cylinders being on one side of the pump and two on the other. Each cylinder has its own eccentric, the valve motion being variable in the high pressure cylinder and fixed in the others. A throttling governor controls the speed. The proportions are: High-pressure cylinder, 21 inches; intermediate pressure, 34 inches; low pressure, 39 inches; stroke, 24 inches; indicated horse power, 1,425 to 1,600. The engine weighs, complete, 45 tons.

The engine for driving the electrical generator is of the usual vertical marine type, triple expansion, three cylinders working on three cranks. Cylinder diameters are: High pressure, 14¼ inches; intermediate pressure, 22¾ inches; low pressure, 37⅜ inches; stroke, 24 inches. The diameter of main shaft is 7⅜ inches; indicated horse power, 800; revolutions, 200 per minute, and total weight of engine, about 25 tons. A large governor acts on the valve gear of the high-pressure cylinder, regulating the speed. The cutters are driven by a pair of horizontal tandem compound engines placed side by side, with shafts coupled together to quarter cranks. A throttling governor of the Pickering type acts on the common steam pipe. These engines are very compact; substantial guides maintain the cylinders and shaft in relative position, and there is no bedplate. Each engine complete with shafts weighs about 6 tons. A 10-inch centrifugal pump provides the circulation in the surface condenser. The upper part of the latter forms a feed-water heater.



THE PILOT HOUSE, SHOWING SWITCHBOARD.

BOILERS, OPERATING DEPARTMENT, CUTTER MECHANISM.

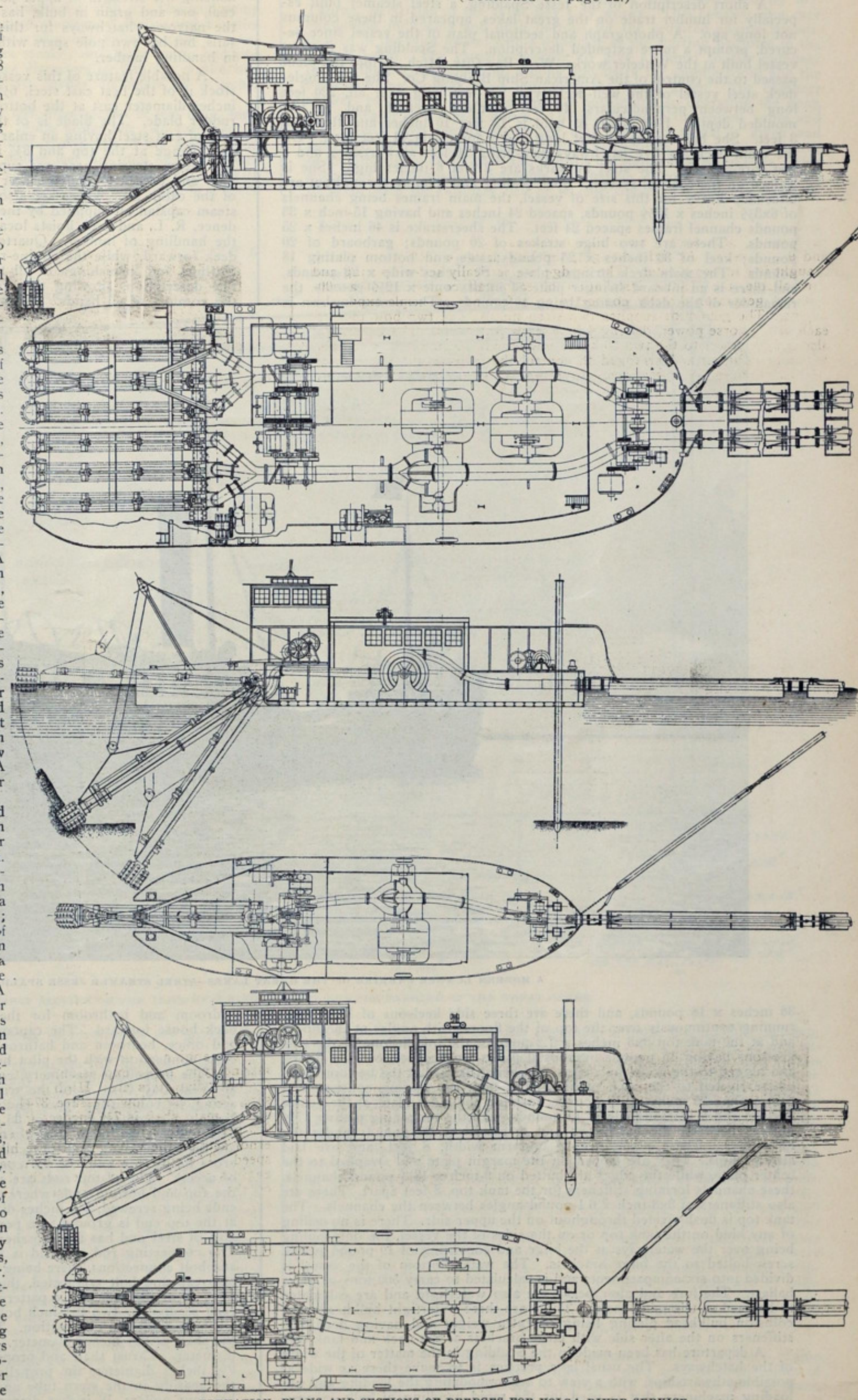
One feature of the dredges which has given great satisfaction is the installation of water-tube boilers, which are of the Babcock & Wilcox marine construction. There are four of these boilers on each hull half, making eight in all, with a total heating surface of 17,200 square feet. In addition to this, a small boiler of the same construction is fitted in a stern-wheel steamer, which acts as a workshop and general tender to the dredgers. This boiler has 1,000 square feet of heating surface. The

boilers are fired exclusively with naphtha. There are four burners of the Holden type fitted to each boiler in the dredge and two in the stern wheeler. The spraying of the naphtha into the furnace is accomplished by a steam jet. On the official trials, which took place May 24 to 29, the boilers worked without a hitch, giving an abundance of steam. On the full-power trials, with all the machinery running, no trouble was experienced in keeping the water level constant or in getting a sufficiency of steam, although working at a very high rate of evaporation, which would be, judging from horse power of engines, nearly 8 pounds of water per square foot of heating surface per hour. The combustion of the naphtha was very good, practically no soot being formed on the heating surface. Temperature taken of the funnel gases showed these to be low, namely, about 500 degrees. The boilers are constructed so as to facilitate the cleaning of the tubes, both internally from the scale and externally from soot, etc. Repairs can be readily carried out on the boilers by the engineering staff, no skilled boilermakers being required for this work. A tube can be taken out and replaced in about twenty to twenty-five minutes, and as all the tubes are expanded, no special tools are required, excepting an ordinary expander.

The pilot house or operating room is on the third deck in the forward part of the deck house. It is placed above the cabins, and large windows on all sides permit a clear view of surroundings. Against the front of the room and in the center of the boat is a stand of levers, which are connected to operate the friction clutches and brakes of a four-drum hoist below, the steam valve of the hoist, and the reversing gear. In addition, the steam-controlling gear of the engine driving the cutters is operated from the same place, putting all cutter movements under the operator's hand. A complete system of signal and alarm bells, cords to three steam whistles, speaking tubes, and a telephone to the end pontoon are within reaching distance. At the sides of the operator are the switches and controllers for the electric motors. The rear of the room is taken up with a marble-panel switchboard, rheostat, compensators, and other electrical appliances. Ample light and ventilation are assured, and for night there is an electrical projector or search light, which is controlled from below and can be directed where wanted. A steam steering wheel occupies the center of the room.

That the mixture of solid matter and water shall be of the right proportion for the best output of material, four Bates cutters are mounted on each hull. In order that work may be done at different depths, these cutters, through proper mechanism, raise and lower on a fixed horizontal axis on the dredge; the cutters may descend to a depth of 16 feet. The cutter engine, located in the forward part of the hull, drives a countershaft, which coincides with the horizontal axis of cutter movements. A pair of miter gears transmits the power to the ladder shaft, which carries at its outer end a bevel gear engaging one on the head of the cutter shaft. Inside and concentric with the cutters are the suction pipes, carrying an adjustable mouth of suction end which terminates about 1 foot above bottom face of cutter. The arrangement of suction pipes and cutters is seen to form two distinct ladders, supported one on either side of hull and approaching each other at the bow. Here the adjoining suction pipes are bolted together through the medium of a cast distance piece, giving solidity to the whole. When the cutters are down in normal working position, they may work backwards as well as forwards, taking a face the full depth of the cutter. The greater part of the weight of cutters and suction pipes is carried by the two hoisting cables, through sheave blocks and sheave legs, to the hoisting drums, by which the depth of the cutters is regulated. The chief reliance for protecting bearings which are under water is a constant stream of water fed to the center of each journal at a pressure of about 60 pounds from a special pump on the dredge. Removable sheet iron covers with hand-holes are placed over all gears which are under water. The ladder pipe throughout is of cast steel and is supported at the hull by two trunnions, which are carried by strong cast-steel bracket bearings. The trunnions are bored out

(Continued on page 22.)



ELEVATION, PLANS AND SECTIONS OF DREDGES FOR VOLGA RIVER SERVICE.

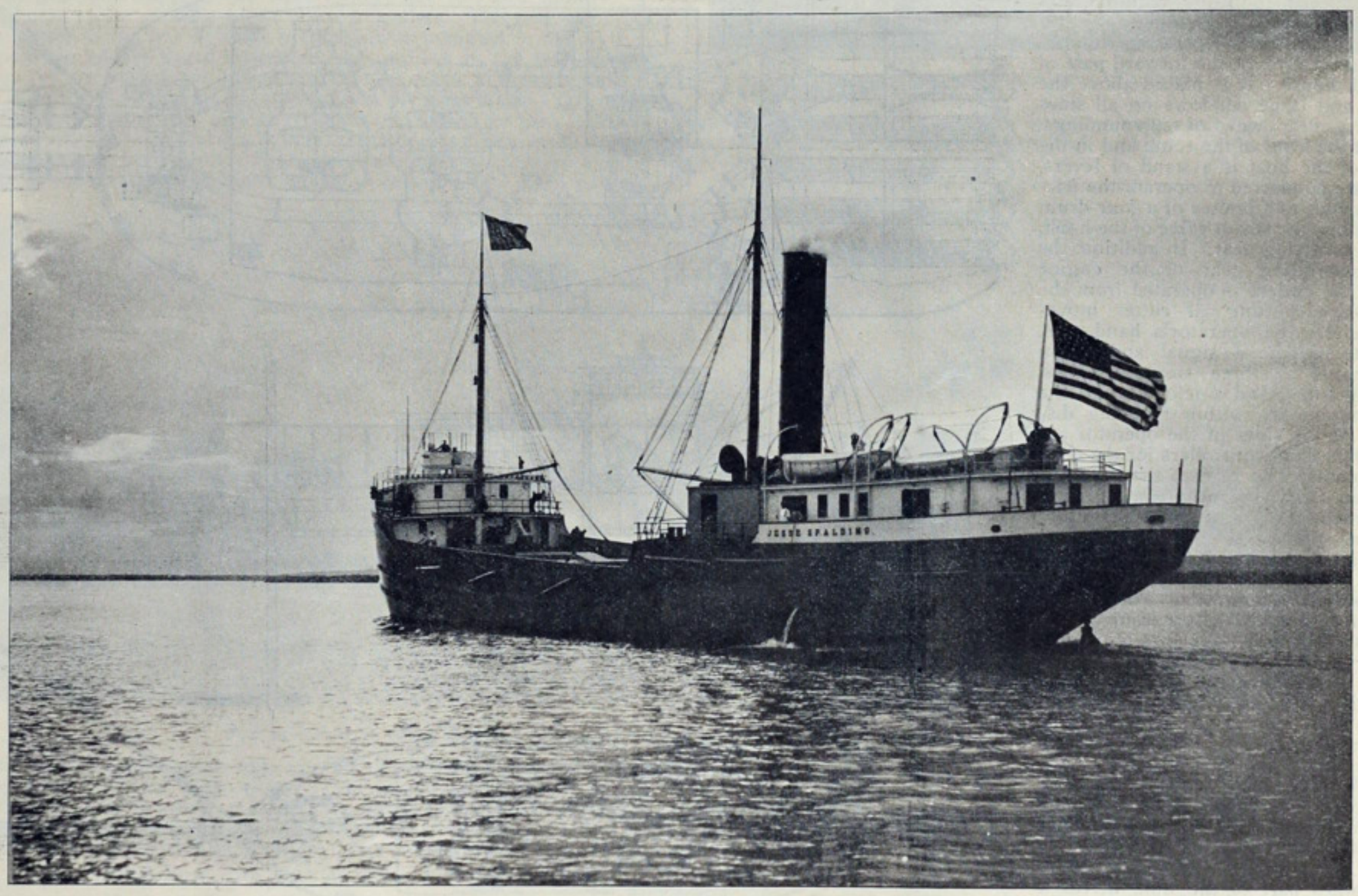
A MODERN LAKE LUMBER CARRIER.

A VERY COMPLETE DESCRIPTION OF THE STEEL STEAMER JESSE SPALDING, RECENTLY BUILT AT WEST BAY CITY, MICH.

A short description of the Jesse Spalding, a steel steamer built especially for lumber trade on the great lakes, appeared in these columns not long ago. A photograph and sectional plan of the vessel since secured, prompt a more extended description. The Spalding was the last vessel built at the Wheeler works, West Bay City, Mich., before the plant passed to the control of the American Ship Building Co. She is a single-deck steel vessel of the well-deck type, 236 feet long over all, 220 feet long between perpendiculars, 40 feet moulded breadth and 16 feet moulded depth. Her depth of hold is 13 feet 10 inches and the tank 3 feet. She has a poop 86 feet long and a forecastle 44 feet long. On the main deck are five hatchways measuring 20 feet athwartships and 8 feet fore-and-aft. The steel bulwarks are 3 feet 6 inches high. She is framed on the channel system. Shell plating and framing throughout are unusually heavy for this size of vessel, the main frames being channels of 6x3½ inches x 13½ pounds, spaced 24 inches and having 15-inch x 33 pounds channel frames spaced 24 feet. The sheerstrake is 46 inches x 25 pounds. There are two bilge strakes of 20 pounds; garboard of 20 pounds; keel of 36 inches x 25 pounds; side and bottom plating 18 pounds. The main deck stringer plate is 80 inches wide x 23 pounds, and there is an inboard stringer plate 54 inches wide x 12½ pounds, the remainder of the deck plating being 10 pounds. The center keelson is 36 inches x 18 pounds, and there are three side keelsons of 15 pounds running continuously over the top of the floors, with angles at the floors and at the tank top 3x3 inches x 7.2 pounds, the middle one of the side keelsons having 15 pounds intercostal plates worked between the floors, and lugged to the floors by angles, and being flanged at the bottom edges where riveted to the shell plating. The tank top plating consists of a centre plate 36 inches x 16 pounds, forming the rider plate of the centre keelson and a margin plate of 15 pounds, with the remaining plating 17½ pounds between the hatchways and increased to 20 pounds under the hatchways. These plates are of uniform width, 8 feet, and are laid athwartships. They are lapped on the margin plate and strapped to the center plate, while the edges are butted on 9-inch x 13¼-pound channels, these channels forming stiffeners for the tank top, 8 feet apart. There are also stiffeners of 3x3-inch x 6.1-pound angles between the channels. The tank top is flush-riveted throughout on the upper side. There is no ceiling of any kind on the tank top or on the sides of the vessel, the only ceiling being over the waterways at the bilge and consisting of 10-pound plates, screw-bolted to the bilge brackets. The water bottom of the vessel is divided into six compartments and is calculated to carry 500 tons of water ballast. The fore and after peaks are also watertight and are calculated to be used as trimming tanks. There are three watertight bulkheads, the collision bulkhead plating being of extra weight and having deep web stiffeners on the after side with large brackets at the deck and tank top.

A departure has been made in the Spalding in the matter of the width of the hatchways. The usual lake practice is to make these as wide as possible athwartships, with a view to accommodating the loading and unloading machinery that is used for the rapid handling of bulk cargoes, thus limiting the width of the upper deck stringer plates to the least possible safe dimensions. In the special trade for which the Spalding was primarily designed the very wide hatchways are not considered a necessity, while more unobstructed room on deck for carrying lumber is desirable, and thus the stringer plates are unusually wide, greatly enhancing her strength in upper parts. Experience with the ship, carrying coal, ore and grain in bulk, has shown no disadvantage on account of the narrower hatchways for this size of vessel. The vessel carries no sails, but has two pole spars with derrick booms rigged on these for use in handling lumber.

A notable feature of this vessel is the construction of the rudder. The stock is of the best cast steel, 6½ inches diameter, having a flange of 12 inches diameter cast at the bottom end, by which it is connected to the rudder blade. The blade is of the counterbalanced type and is a single web of cast steel having an enlarged portion in the line of the stock and with flange at the top and 3¾-inch pintle at the bottom cast with it. The steam steering gear was supplied by Williamson Bros. of Philadelphia and can be operated either from the pilot house or from the top of the cabin aft. There are also a steam capstan windlass forward and steam capstan aft supplied by the American Ship Windlass Co. of Providence, R. I., and deck hoists located at the forward and after hatches for the handling of lumber. Quarters for the deck crew are on the main deck forward, while the engine-room staff and stewards are berthed aft. Fittings and furnishings of all the crews' quarters are of an unusually fine description, showing that careful consideration has been given to the comfort of all hands. A specially furnished parlor with connecting bedroom and bathroom for the use of the owner is located in the deck house forward. The captain's quarters, consisting of sitting room and office, bedroom and bathroom, are located on the forecastle-top in close connection with the pilot house.



A MODERN LUMBER CARRIER OF THE GREAT LAKES—STEEL STEAMER JESSE SPALDING.

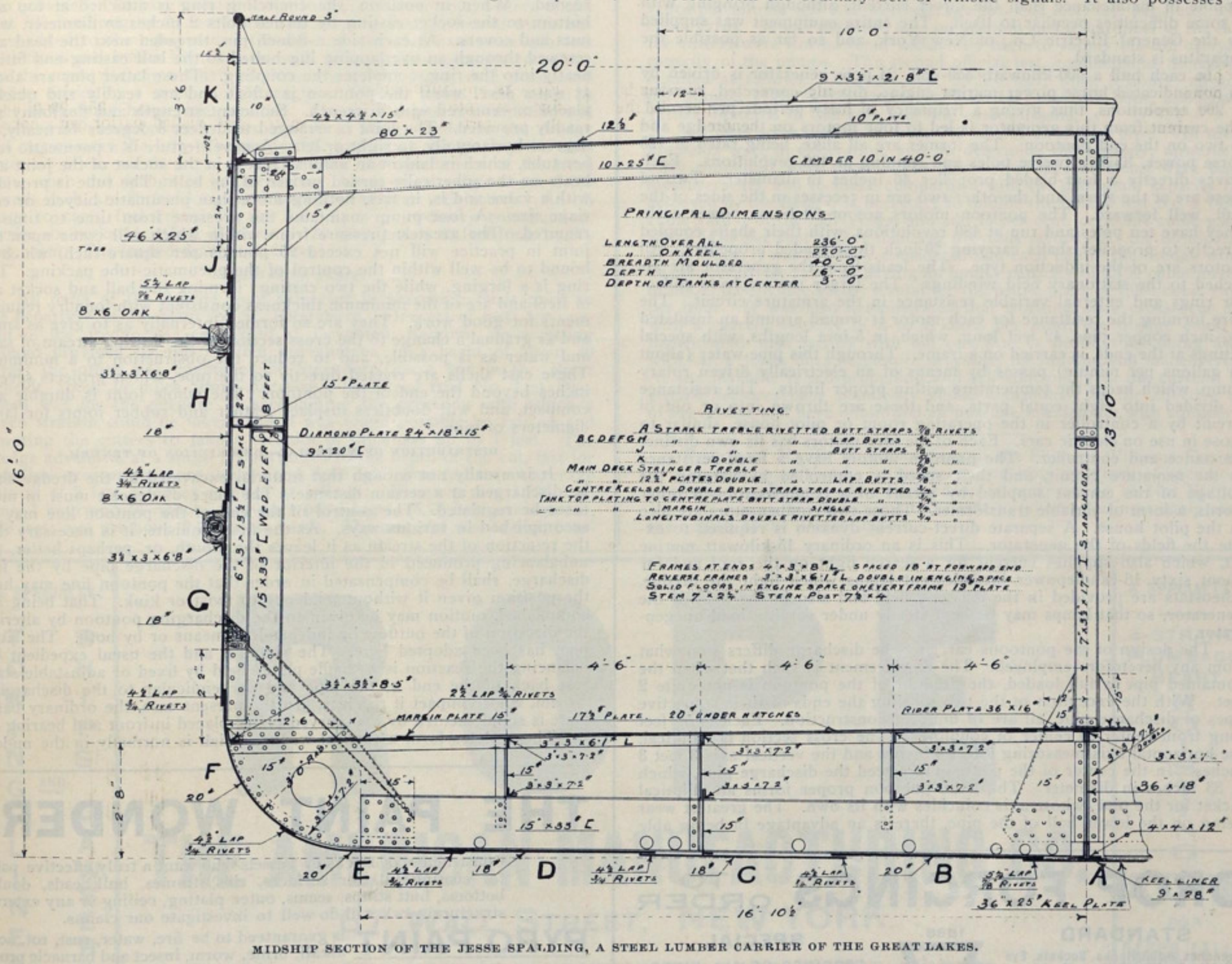
The propelling machinery, constructed in the Wheeler machine shop at West Bay City, is of the triple-expansion, inverted-cylinder, direct-acting, jet condensing type. Cylinders are 17, 28 and 47 inches diameters, having a common stroke of 36 inches. The cylinders are unjacketed. The frame consists of three cast iron columns at the back, on which are the guide faces, and four columns in front, so placed as to leave the cross heads, top ends of the connecting rods and valve gear very easy of access. The piston rods are of steel, 4½ inches diameter, tapered at the top and bottom ends where fitting in the piston and crosshead, the ends being screwed, 3¾ inches diameter, and secured by nuts. The taper at the top end is ground to a perfect fit in the piston. The crosshead is also of steel and has the crosshead pins, 4½ inches diameter, forged on. The connecting rod top end is forked and fitted with brasses with cap and bolt connections, there being four 1⅞-inch bolts. The bottom end is also cap and bolt connected, there being two 2½-inch bolts. The bed plate is of the usual box pattern having six main bearings, the cap of each secured by two 2½-inch bolts. The crank shaft is built up, having all three cranks in one section. The shaft and webs are of wrought iron, the shaft of 9½ inches diameter. The crank pins are of steel, 9½ inches diameter. Thrust shaft and propeller shaft are also of wrought iron and 9½ inches diameter, the propeller shaft being enlarged to 10 inches at the bearing in the stern tube and at the stuffing box. The thrust shaft has four collars, 16 inches diameter, forged on. The thrust block is of

the horseshoe type, having four collars, each separately adjustable. The bearing surface of the thrust block is 308 square inches. A sectional propeller of cast iron is 11 feet 6 inches diameter by 13 feet pitch.

All the pumps are independent of the main engines. They were supplied by Dean Bros., of Indianapolis. The air pump is of the single-cylinder, double-acting type 8 inches and 16 inches diameters by 8 inches stroke, and has the jet condenser in combination with it. The feed pump is of the duplex type with outside packed plungers, 7 inches and 4 inches diameters by 10 inches stroke. There is also one ballast pump, 7 inches and 10 inches diameters by 10 inches stroke; one bilge pump and one pony pump, each 6 inches and 4 inches diameters by 6 inches stroke, and one cold water pump 4 inches and 3¾ inches diameters by 4 inches stroke, all of the duplex type.

There are two Scotch boilers, 10 feet diameter by 12 feet long, built by Wickes Bros. of Saginaw, Mich. Each boiler has two furnaces, 42 inches diameter and 9 feet 3 inches long, the length of the grates being 6 feet. The total grate surface is 84 square feet and total heating surface 1745 square feet; working pressure 170 pounds per square inch. With the vessel loaded to a draught of 14 feet 9 inches and running at a speed of 12 miles per hour the engines, making 88 revolutions per minute, develop 900 I. H. P.

The equipment of this vessel as regards electric lighting, electric engine signals and telephones is unusually elaborate and deserves especial notice. The lighting plant is of the General Electric Co.'s usual direct-connected marine type. There is one 10 K. W. generator running at 450 revolutions per minute with a voltage of 110. The lighting system is divided into six main circuits, these being subdivided into smaller sections at distributing centres throughout the vessel. The circuit for the masthead and side lights is independent of all other circuits and is controlled by a separate switch, this considerably reducing the possibility of disturbance of these lights, a vital point when the crowded condition of the narrow and tortuous channels of the connecting waters of the great lakes is considered. To still further safeguard these lights, there is in the pilot house a system of alarm bells and indicators, which give warning immediately if from any cause any one of the lights should be extinguished. There is also a search light located on the top of the pilot house for use in finding channel marks in the rivers and for use also in the Sault canal. In the wiring of the vessel wood mouldings are almost entirely dispensed with, the main and branch wires all being run through armored steel conduits. At every point where a branch connection is made, or where a lamp is located, watertight cast iron junction boxes are fitted. Where these conduits run through the hold of the vessel they are suspended by stirrups from the beams and are free to expand and contract by variations of temperature or by the working of the vessel. There are in all 110 incandescent lights. Four arc lamps are also provided for use in port when loading and unloading, connections for these being located at convenient places on the poop and forecastle head. All fixtures and connections liable to be exposed to moisture are watertight. All lamps in the hold and on deck are covered with vapor-proof globes and strong wire guards. Besides the usual whistle and bell signals there is a system of electric engine signals, designed and constructed by Mr. Thorne, electrician at the West Bay City works. This consists of a case containing indicators and push buttons for the required engine signals, located in the pilot house, with a duplicate at the starting platform in the engine room. The captain desiring to give a signal to the engineer pushes the necessary button, a gong sounds in the engine room and the corresponding pointer rises, indicating the signal given. The engineer answers by pushing the corresponding button and so operating the gong and indicator in the pilot house. The indicators in the engine room and pilot house then remain stationary until the next signal is given and answered by the captain and engineer respectively, when the indicator of the first signal drops back and that for the signal now given rises. This apparatus is designed to overcome the chances of confusion always liable to occur with the ordinary bell or whistle signals. It also possesses all the advantages of a mechanical telegraph, without the difficulty of keeping chains and wires, in proper adjustment. This difficulty, always experienced with chains and wires, is the more dangerous on lake vessels where the engine room and pilot house are in extreme ends of the vessel. There is also a telephone system connecting the bridge and captain's room with the engine room and after poop deck, by which the captain can send necessary orders aft for the working of the engines or for handling the vessel when working into or out of port.



MIDSHIP SECTION OF THE JESSE SPALDING, A STEEL LUMBER CARRIER OF THE GREAT LAKES.

The Spalding has shown herself to be a very efficient cargo vessel, having on a recent trip carried 1932 gross tons of iron ore on a draught of 14 feet 8½ inches, running at an average speed of 12 miles an hour. Material and workmanship on the Spalding were of the very highest order throughout and her general appearance is evidence of the care and skill expended in her construction. It was required in the contract for this vessel that she should receive the highest rating given by the Great Lakes Register, and during construction the surveyors of that register were constantly in touch with all work on hull, machinery and electrical equipment. She is therefor classed 100 with Crescent and Star, and in addition has a special mark indicating that she is built in excess of the rules. The Spalding is the first vessel on the lakes to which this special mark has been given. Her commander is Capt. James Travis.

Capt. Charles D. Sigsbee, former commander of the battleship Maine and later of the Texas, has been assigned to duty as chief of the office of naval intelligence. Commander Richardson C. Clover, the present chief, goes to London as naval attache at the United States embassy.

IMMENSE ELECTRICAL DREDGE.

(Continued from page 19.)

around the center of rotation to permit the countershaft to pass through the inner one. The shaft has an outward bearing midway between the two trunnion bearings.

ELECTRICAL SYSTEM—DESIGN OF PONTOONS.

The propulsion of the dredge is accomplished entirely by screws driven by electric motors, all other movements being effected by the direct use of steam. The fundamental idea in the installation of the electrical equipment, as indeed of all the machinery, has been that the directing mind in the operating room should have close at hand and always ready for instant use the means to start, stop, or modify all the movements of the great machine. To this end, the means of absolutely controlling the entire electrical apparatus is placed back of and to the right and left of the operator in the form of switches, rheostats, controllers and compensators. The system adopted is the three-phase alternating current, permitting cheaper and lighter machinery and promising less trouble in maintenance than the direct current, although bringing with it some difficulties peculiar to itself. The entire equipment was supplied by the General Electric Co., of New York, and so far as possible the apparatus is standard.

In each hull a 600-kilowatt, 550-volt, 24-pole generator is driven by an 800 indicated horse power marine engine, directly connected, running at 200 revolutions, thus giving a frequency of forty periods per second. The current from this generator is led to four motors on the dredge and to two on the end pontoon. The former are all alike, being rated at 125 horse power, having twelve poles and running at 400 revolutions. Each drives directly a four-bladed propeller 46 inches in diameter. Two of these are at the stern, and the other two are in recesses in the sides of the hull, well forward. The pontoon motors are of 30 horse power each. They have ten poles and run at 480 revolutions, with their shafts coupled directly to propeller shafts carrying 20-inch three-bladed propellers. All motors are of the induction type. The leads from the generator are attached to the stationary field windings. The larger motors have collector rings and external variable resistance in the armature circuit. The wire forming the resistance for each motor is wound around an insulated 2¼-inch copper pipe, 42 feet long, which, in 5-foot lengths, with special fittings at the ends, is carried on a frame. Through this pipe water (about 15 gallons per minute) passes by means of an electrically driven rotary pump, which keeps the temperature within proper limits. The resistance is divided into eight equal parts, and these are thrown into or out of circuit by a controller in the operating room or pilot house, similar to those in use on electric cars. Each of the four motors has its own distinct resistance and controller. The pontoon motors have a fixed resistance in the armature circuit, and their speed is controlled by varying the voltage of the current supplied by means of a compensator—in other words, a form of variable transformer. Those two compensators are also in the pilot house. A separate direct-current dynamo is required to excite the fields of the generator. This is an ordinary 15-kilowatt marine set, which also supplies current for a search light on the roof and for about sixty 16-candlepower incandescent lamps which light the dredge. Rheostats are provided in the exciter's field and also in the field of the generator, so that lamps may be kept steady under varying load on generator.

The design of the pontoons carrying the discharge differs somewhat from any heretofore employed. The displacement is such that when the contained pipe is full loaded, the draught of the pontoon is not quite 2 feet. With the exception of the two forming the ends of their respective lines of discharge pipe, all are of uniform construction. Each is 50 feet long from center to center of couplings. The cross section is elliptical, the horizontal axis measuring 9 feet 3 inches and the vertical axis 3 feet 3 inches. In the center of the pontoon is placed the discharge pipe, which is 33 inches in diameter. Thus, the pontoon proper forms an elliptical jacket for the pipe, whose axis coincides with its own. The greatest wear being on the lower half of the pipe, there is an advantage in being able to invert it, which the symmetrical form of pontoon makes a simple matter. This section also has an advantage over the circular in having less draught and a stable equilibrium, enabling the men to walk freely along the line. There is an advantage as well over the rectangular section, in that there are no edges and hence no longitudinal angles with corresponding increase in amount of riveting. The form is one least influenced by wind, wave or current. The total length of the pontoon and the angle of deflection to be afforded at the coupling are determined, of course, by the curvature required of the line of pontoons as a whole. In this case, the length of pontoon adopted being 50 feet, 10 degrees was fixed as the angle to which the coupling must permit deflection. This gives the line of pontoons a maximum possible curvature which corresponds to a railroad curve of about 20 degrees; or the whole line of 1,000 feet can be brought around to a little more than a semicircle.

The coupling adopted between pontoons is of a novel type and finds its first practical application in this plant. It is a compound device and may be called a coupling and joint combined, the former element being of the universal type and the latter of the ball and socket. All of the strain comes on the first, and water tightness is provided for by the second. When in position, the encircling ring is attached at top and bottom to the socket casting by turned bolts 2 inches in diameter, with nuts and covers. At each side a 2-inch pin, threaded next the head and screwed through an overlapping lug bolted to the ball casting and fitting neatly into the ring, completes the coupling. These latter pins are about at water level when the pontoon is afloat and are readily and quickly placed or removed with a wrench. Sufficient strength and flexibility are readily provided. The joint is arranged to deflect 8 degrees vertically, 10 degrees horizontally, to right or left. A novel feature is a pneumatic rubber tube, which is laid in an annular recess in the socket of the joint and bears on the spherically turned surface of the ball. The tube is provided with a valve and is, in fact, nothing more than pneumatic bicycle or carriage tire. A foot pump maintains the pressure from time to time as required. The greatest pressure from within which will come upon the joint in practice will not exceed 25 pounds per square inch, which is bound to be well within the control of the pneumatic-tube packing. The ring is a forging, while the two castings forming the ball and socket are of steel and are of the minimum thickness consistent with foundry requirements for good work. They are so formed internally as to give as small and as gradual a change to the cross section of the flowing stream of sand and water as is possible, and to reduce the obstruction to a minimum. These cast shells are riveted directly to the pipe, which projects several inches bevond the end of the pontoon. The whole joint is durable and compact, and will doubtless displace leather and rubber joints for large diameters of pipe.

DISTRIBUTION OF MATERIAL—DESCRIPTION OF TENDER.

It is usually not enough that material excavated by the dredge shall be discharged at a certain distance. The place of deposit must in most cases be regulated. The control of the end of the pontoon line may be accomplished in various ways. As the first requisite, it is necessary that the re-action of the stream as it leaves the mouth, or, perhaps better, the unbalancing produced in the interior of the discharge pipe by the free discharge, shall be compensated in order that the pontoon line may hold the position given it without tendency to twist or kink. That being accomplished, motion may be given to the discharging pontoon by altering the direction of the outflow by independent means or by both. The latter plan has been adopted here. The simplest and the usual expedient for balancing the reaction is a "baffle plate" held by fixed or adjustable stays just back of the end of the pipe and perpendicular to the discharging stream, whose impact it receives. In the present case, the ordinary baffle plate is supplemented by two curved plates placed in front and bearing on it. These plates form a vertical wedge, which is normally in the middle

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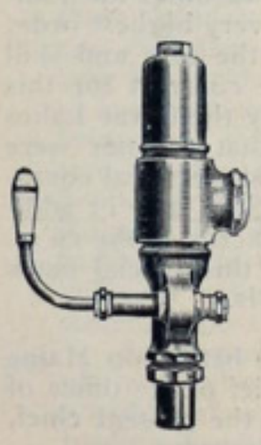

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of the discharge stream, divides it in equal parts, and deflects both equally to right and left. On the back of this wedge is a horizontal rack moved by a fixed pinion, which receives its rotation from the pontoon through a handwheel and a worm gear. By moving this wedge to one side or the other, the horizontal balance of the deflected stream is destroyed and transverse motion is thus imparted to the pontoon. It will be noted that as the discharge stream is diverted laterally in all positions of the wedge, the effect as regards longitudinal equilibrium is the same as with the baffle plate. To more fully and freely handle the pontoon line when not running, the designer has added a compartment to the end of the last pontoon, in which are installed two 30-horse power three-phase induction electric motors, each driving directly a 20-inch screw propeller and obtaining current from the dredge. These are controlled by the operator in the pilot house, and with the adjustable baffle-plate device give great freedom of movement.

In addition to the large amount of machinery on each dredge half, accommodations are provided for seventeen officers and men above and below the main deck, with the appropriate galley and ward rooms. A blacksmith forge, with necessary tools and facilities for light repairs, is also provided. To give greater scope to these departments, a stern-wheel boat 125 feet long by 26 feet beam and drawing but 2½ feet of water has been added to the equipment. On this are provided handsome quarters for officers and bunks for ten men, with culinary arrangements complete. On the main deck is a small machine shop, with lathe, drill press, and shaper, driven by a small upright engine. Electric lights, with a search light on the pilot house, are provided. The main engine is compound and indicates 200 horse power. This boat is to act as tender to the dredge and carries near the bow a boom derrick and pump for placing the steel water-jet piles, which serve as anchors for the attachment of the head lines, when the dredge is in operation. These piles weigh about 3,000 pounds each, are 30 feet long, and have proven very satisfactory. An oil barge to carry fuel completes the list. It is of ordinary construction, carries six tanks of a total capacity of 130 tons, and is 80 feet long by 20-foot beam. The loaded draught is 4 feet.

A SERIES OF TESTS.

All parts of the dredge were subjected to searching trials prior to the departure of the plant for St. Petersburg. One set of tests for one-half of the dredge was conducted at Drygoten, Belgium, on a testing ground provided by the Belgian government, in a basin of about 40 acres; the other was conducted at Steendorp, on a bar in the River Scheldt, about 10 miles above Antwerp. Unofficial trial No. 1 at Drygoten was for the purpose of ascertaining the precision with which a given stratum could be taken, and it was found possible by raising and lowering the cutters to take a stratum of thickness up to 7 feet. The dredge advanced, at a speed proportioned to the depth of the cut, fast for a shallow excavation, more slowly for a deep one. One test for an average cutting of 2 feet 4 inches resulted as follows: Distance run, 1,200 feet; time, 1 hour and 16 minutes; advance per minute, 15.78 feet; average cut, 2.38 feet; rate per hour, 2,590 cubic yards. The material was of fine, compact sand and clay. This had been formerly farm land below the plane of cultivation. The cultivated surface had been previously removed for the construction of levees. Two weeks later, the first official Russian trial was made in a cut parallel to the former, with higher steam, more pump revolutions, and a crew which had become familiar with the mechanism. In this trial, the result was as follows: Distance run, 1,000 feet; time, 37 1-3 minutes; advance per minute, 26.8 feet; average cut, 2.44 feet; rate per hour, 4,524 cubic yards. The material in this cut was favorable, half of it being a loose sand, the other half a compact sand mixed with clay.

Trials of the other half of the dredge were conducted on a large bar at Steendorp composed of very fine sand. Some cuts were along hard, packed material; others were in material relatively loose. None of the material on the Scheldt is of so favorable a character as the coarse, loose sand met with in the cross-over bars of the Volga and Mississippi rivers. Preliminary to the officials trials, two prolonged tests were made at Steendorp to determine methods of sounding and measurement. The first test showed an average rate of advance per minute of 10.13 feet; average cut, 5.66 feet; rate per hour, 3,824 cubic yards. In another place, the advance per minute was 9.09 feet; average cut, 4.62 feet; rate per hour, 2,803 cubic yards. It was observed that on account of the hardness of the face, the cutters were not powered sufficiently high to supply the full carrying capacity of the pumps. The second official test, conducted at Steendorp, resulted as follows: Distance run, 2,129.5 feet; time, 3 hours; advance per minute, 11.83 feet; average cut, 3.52 feet; rate per hour, 2,860 cubic yards. Material in this case was fine compact sand.

All tests were conducted with 700 feet of discharge pipe. All measurements were in excavation, and, to determine the capacity, upwards of 5,500 soundings were taken. The Mississippi measurements were barge measurements, and to make comparison with the maximum capacity rate achieved by the Beta, it is necessary to double the official test No. 1 (4,524 cubic yards) of the half Volga, and add 15 per cent, or 10,404 cubic yards, which is 30 per cent higher than any previous record. At the termination of the trials, it was officially considered that each half of the dredge would be conservatively rated as having an hourly capacity of 2,700 cubic meters, or about 3,500 cubic yards; a total for the whole plant of 7,000 cubic yards per hour. It was also demonstrated that working on a cross-over bar, with a current velocity of 3 to 4 knots per hour, the dredge could be maneuvered with facility with but one line (a head), thus doing away with half a dozen lines heretofore necessary for holding and maneuvering. As the machine is self-propelling and self-controlling in the current, the electric features have manifestly added enormously to the effective use of the dredge and have minimized all possible interference with commerce.

Friends of Mr. E. M. Richardson of the Sherwin-Williams Co., will be pleased to learn that he is fast recovering from an attack of pneumonia contracted in Boston. Mr. Richardson is recuperating at Hot Springs, Va. He writes that he expects to be able to take up business again about the middle of the present month.

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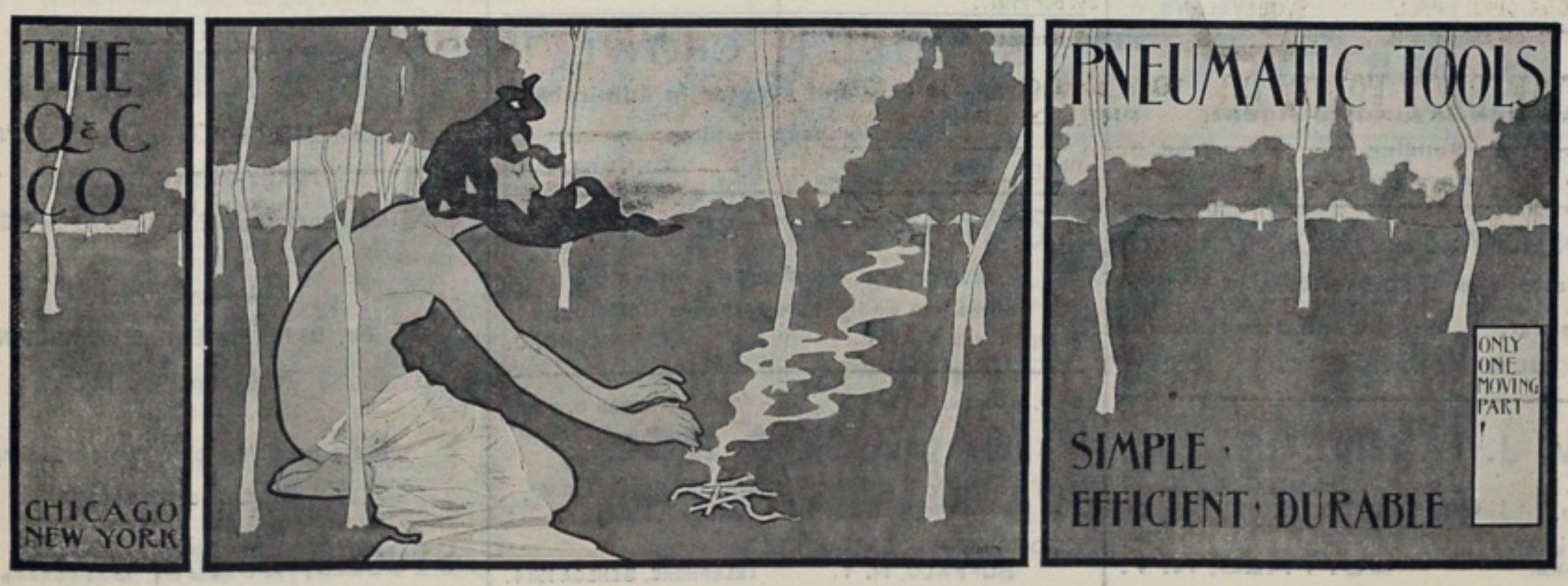

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U. S. Engineer Office, 185 Euclid Avenue, Cleveland, O., October 31, 1899. Sealed proposals for removal of wreck of schooner H. G. Cleveland and cargo, lying in about 50 feet depth of water in Lake Erie, near Cleveland Harbor, Ohio, will be received here until 2 p. m., standard time, November 10, 1899, and then publicly opened. Information on application. Jared A. Smith, Col., Engrs.

Office of the Light-House Board, Washington, D. C., October 19, 1899. Sealed proposals will be received at this office until 2 o'clock p. m., on Monday, the 6th day of November, 1899, for furnishing the materials and labor necessary for the construction and delivery of a first-class steel steam light vessel, No. 73, for a fixed sum for said vessel delivered at the Buoy Depot at Woods Hole, Mass. Forms of proposals and plans and specifications, showing what is required, can be had or seen by applying to this office. F. J. Higginson, Rear Admiral, U. S. N., Chairman. Nov. 2.

U. S. Engineer Office, Montgomery, Ala., October 20th, 1899. Sealed proposals for building a sea-going hydraulic dredge will be received here until 12:00 M., November 22d, 1899, and then publicly opened. Information furnished on application. C. A. F. FLAGLER, Capt., Eng'rs. Nov. 16.

U. S. Engineer Office, Galveston, Tex., Oct. 16, 1899. Sealed bids, in triplicate, for deepening channel from Galveston Harbor to Texas City, Tex., will be received here until 2 p. m. Nov. 15, 1899, and then publicly opened. For information apply to C. S. Riche, Capt., Engrs. Nov9

U. S. Engineer Office, Montgomery, Ala., October 11, 1899. Sealed proposals for dredging on Carrabelle Bar, Fla., will be received here until 12 m., November 14, 1899, and then publicly opened. Information furnished on application. C. A. F. Flagler, Capt., Engrs. Nov9

U. S. Engineer Office, Montgomery, Ala., October 11, 1899. Sealed proposals for dredging in Apalachicola Bay, Fla., will be received here until 12 m., November 14, 1899, and then publicly opened. Information furnished on application. C. A. F. Flagler, Capt., Engrs. Nov9

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